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The competition model: From language processing to pedagogical implications

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The competition model is a psycholinguistic model which was first introduced to account for language processing, yet over time, the model was generalized to deal with the areas of first and second language acquisition. As a functionalist model, the 'competition model' suggests that language forms are at the service of communicative functions. It also draws on connectionism, and thus emphasizes the importance of frequency and the information value of linguistic input. Furthermore, it is based on the hypothesis that human beings do not need to have any innate brain module for language learning. However, it does not reject the innate and psychological mechanisms underlying language acquisition. The present article attempts to discuss the principles of the 'competition model' and the possible pedagogical implications of it.

Key words: Competition model, functionalism, cues, two-level mapping, unified competition model, chunking, buffering, resonance.

INTRODUCTION

The essence of Competition Model portrays the idea that mental processing is competitive in the classical Darwinian sense. If we consider the biological world, we realize that each species is attached to a particular niche or habitat. In that niche, each member while cooperating in the competition against other species, competes with other members of its species. The abilities and tendencies of competing species, of predators, and of species that serve as food sources tightly control the habitat of them. The mental world also echoes the same tight, interlocking dependency, as MacWhinney (1986) suggests. As far as perception is concerned, many ideas are called to the mind, but few are chosen. The final perception of a situation is determined by those constructs which, together, most successfully matched the stimulus. The ideas can win out only if they are in harmony with the other ideas in that particular context.

Cooperation causes a percept or an action to gain

strength over the other actions with which it is interrelated. The better it matches other ideas, the more an idea can win out over its competitors. According to what MacWhinney (1986) believes, competition is forever connected with cooperation. The same phenomenon is detected in language processing: here the unit of competition is not the species or the individual, but the lexical item. The domain of each word is formed by the related meanings and sounds and by the range of responses of the lexical items with which it competes. During sentence processing, each lexical item sets up expectations for other lexical items.

When processing is successful, these expectations interlock tightly. Yet, as in natural systems, there is always some variation in the system which can sometimes result in the occurrence of errors.

Theoretical background

One of the controversial issues in psycholinguistics has always been how language is processed in the human's

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mind. Although scholars have offered various theories to account for the phenomenon, their theories are derived from their approaches towards the nature of language processing and language acquisition. In this regard, there are two main schools often referred to as formalism and functionalism. As the names suggest, the divergence between these two schools relates to their approach towards the relationship between form and function. Formalists believe in the autonomy and innateness of language forms. According to what formalists suggest, linguistic forms are independent and irrespective of communicative functions. Yet, functionalists hold that language is governed by human reason and language forms emerge from functional pressures. They argue that functional constraints determine language forms both diachronically and synchronically (Bates and MacWhinney, 1982; Year, 2003). The 'competition model' is a functionalist model (Bates and MacWhinney, 1982, 2003). According to this model, "the forms of natural languages are created, governed, constrained, acquired and used in the service of communicative functions" (MacWhinney et al., 1984, cited in Year, 2003: 5). The competition model rejects the assumption that there is a special mental organ consisting of predetermined linguistic properties; however, it does not rule out the innateness and psychological mechanisms underlying language learning. Instead, Bates and MacWhinney (1982; Year, 2003) argue that language is governed by general cognition and the human mind. Since no mental organ specific to language is assumed, the statistical and informative properties of linguistic input (that is, frequency and information value) are considered to be significant in language processing and acquisition. Lightbown and Spada (2006) also point out that the competition model is tightly linked to the connectionist perspective. The underlying hypothesis is that language acquisition occurs without the need for a learner's focused attention or any innate brain module specialized for language.

Competition model was first proposed as a theory of cross-linguistic sentence processing, which posited that people interpret the meaning of a sentence by taking into account various linguistic cues available in the sentence context and semantic characteristics, to estimate a probabilistic value for each interpretation, and finally choosing the interpretation with the highest probability (MacWhinney and Bates, 1989). More recently, competition model has been developed into a unified theory of first and second language acquisition (Kroll and DeGroot, 2005) and the domain of it has expanded to find explanations for a number of psycholinguistic processes involved in language acquisition, including arenas, cues, storage, chunking, codes and resonance. The expanded version of the competition model suggests that each of these cognitive mechanisms has a role in the activation of representations in the target language that compete in the mind of the learner during acquisition and usage of

the language (Kroll and DeGroot, 2005).

Competition model

Competition model refers to "a model of the way in which syntactic processing is influenced by the nature of the language in question" (Field, 2004: 68). The hypothesis is that speakers of different languages depend on different syntactic cues to form meaning. MacWhinney and Bates (1981) and Field (2004) described the competition model as an explanation for language acquisition that takes into account not only language form but also language meaning and language use. It also accounts for both first and second language acquisition. The competition model relies on four cues: two grammatical, one prosodic, and one semantic: preverbal placement, agreement markers, stress and animacy. These cues connect the level of form to the level of function. They also take part in a competition with each other to take more space in the mind. Cook (1991: 124) explains how the model works: "whatever the speaker wants to communicate has to be achieved through these four.....So, the more a language uses information, the less it can rely on word order, the more emphasis it has on word-forms, the less on word order; and so on."

Cue- strength and cue-validity

MacWhinney (1997) points out that the competition model is similar to the basic Saussurean concept of a form-function mapping. Instead of forms, he suggests the term "cues" which are used by the listener to facilitate the activation of alternative functions. For example, the individual phonological segments in the word "bat" are cues which activate the meaning underlying "bat." The cues in the first two segments would also activate words like "bad" and "bag" and so on. "Cues" as "forms" are only used for comprehension. He suggests that when we consider sentence production, we should think of the underlying functions as cues, and the actual forms being selected as "competing forms." According to the competition model, cue strength refers to the probability or weight that the organism attaches to a given piece of information relative to some goal (MacWhinney, 1978; Sepassi and Aryadoust, 2007); cue strength in the adult native speaker is directly proportional to cue validity. What is crucial about this claim is that cue validity measures are taken from actual text counts based on spoken or written discourse, yet cue strength measures are derived from experiments. In other words, unlike cue validity, which is an objective property of certain cues, cue strength is a subjective property of the individual's knowledge. Cue validity, in essence is the major predictive construct in the competition model

(MacWhinney and Bates, 1984). The idea is that, during language learning, the child discovers the relative order of cues in his language and tunes his cognitive system in such a way that it portrays the environment. At first, the child picks up cues on the basis of their 'overall availability'. To illustrate the mechanism, MacWhinney (1997) states that the English-speaking child pays attention to word order more than his Italian counterpart. And the Hungarian-learning child makes more use of case marking than his German counterpart. Within a single language, if there are two ways to mark a given function, the child will first start to use the one that is more frequent. In this early period, the child will also be under the impact of 'cue detectability', because it is difficult to pick up cues that are hard to perceive.

For example, the Turkish child picks up accusative marking earlier than the Hungarian child, which is largely due to the clearer phonological status of the Turkish accusative suffix (MacWhinney et al., 1985). MacWhinney and Bates (1984) stated that the theory of 'cue validity' is composed of two components: "cue availability and cue reliability".

Cue availability

Cue availability seeks to explain how often a piece of information is offered during a decision making process (Sepassi and Aryadoust, 2007). For example, the availability of accusative case (ra) in Persian is very high. The same case is available in some other languages such as German, but not as frequent as that in Persian. It is also obvious to say that in modern English, accusative case has no availability (Sepassi, 2002).

Cue reliability

Cue reliability shows how often the cue leads to a correct conclusion when it is used. This notion is numerically expressed in the following fraction: the cases in which the existence of a cue leads to the correct conclusion over the number of cases in which it is available; for example a highly reliable cue in English is the preverbal position, for it is always assigned to the agent of a transitive action. Yet, as Sepassi (2002) points out, it is not reliable at all in Persian since OV and SOV syntactical constructions are possible.

As development proceeds, the overall 'availability' of the cues is not as significant as the 'reliability' of the cues. In fact, the learner makes cue strengths to be more and more in tune with the 'reliability' of cues, rather than the availability of them. Particularly, the learner wishes to discover which cue he can rely on when there is a conflict between cues. For example, in English the preverbal positioning cue is both available and reliable, yet when

there is a direct conflict between preverbal positioning and the case-marking cue on personal pronouns, the case marking cue always wins (MacWhinney, 1997). In the end, the final strength value of the cue in the language is determined by the 'conflict reliability'. McDonald and MacWhinney (1989) hold that often a completely adult-like set of cue strengths will be acquired around the age of 12. Competition model suggests that through exposure to thousands of examples of language associated with particular meanings, learners come to understand how to use the 'cues' with which a language signals specific functions (Lightbown and Spada, 2006). For example, the relationship between words in a sentence may be signaled by word order, grammatical markers and the animacy of the nouns in the sentence. Most languages utilize multiple cues, but there is a discrepancy in the primacy of each. This becomes clear in a situation where the meaning of a sentence is not readily intelligible, but what helps a learner to figure out the meaning?

As it was mentioned before, the relationship between the components of a sentence in English is governed by word order, which is subject-verb-object (SVO). Two- and three-year old English speaking children use cues of animacy and their knowledge of the way things work in the world to understand the meaning of odd sentences. Therefore, when they encounter a string of words such as 'box push boy', they will dramatize it as if a boy doll pushes a tiny box, for they believe that that the 'boy' is the natural agent of action in this situation. However, the SVO pattern is so strong in English that, before the age of four, children will give an SVO interpretation to such strings of words. Word order patterns are stronger than animacy cues at this point. Moreover, at this age, they may use the SVO pattern to interpret sentences in the passive voice. That is, 'the box was pushed by the boy' may be interpreted as 'the box pushed the boy.' Only later do they learn to focus on the grammatical markers which differentiate the active voice sentence from the passive word order (Lightbown and Spada, 2006).

Word order is more flexible in other languages such as Spanish and Italian. As MacWhinney (1997) points out, the speakers of such languages even as adults, rely more on grammatical markers (for example, the agreement of subject and verb, the case marking of pronouns) or on the animacy of nouns to understand the relationship between the elements in a sentence. English learners of Spanish or Italian may find it hard to resist their tendency to rely on word order as the basis for interpretation. For example for an English speaking learner of Italian, sentences such as 'It giocattolo guarda il bambino (the toy -is looking at-the boy) would seem to be confusing. An Italian speaker, having a more flexible word order in Italian, focuses on the animacy of the two nouns and comes up with the most logical interpretation as 'boy is looking at the toy'.

According to the competition model, second language acquisition requires that learners learn the relative importance of the different cues appropriate in the language they are learning (MacWhinney, 1997).

Two-level mapping

Two-level mapping is derived from the functionalist claim that the forms of language are at the service of communicative intentions. Only two levels of units are specified in this performance model: a functional level (all the meanings and intentions expressed in an utterance) and a formal level (all the surface forms or expressive devices available in the language) (MacWhinney, 1987). For both the L1 and the L2 learner, the functional basis of particular linguistic devices has the main role in shaping the learning process. Students of language acquisition generally agree that at the initial stages of learning utterances are semantically motivated. In the competition model (MacWhinney, 1987), on the other hand, semantic motivation is believed to be accompanying the learning process. Competition model suggests that language learning is fully functionally motivated, portraying its view in the way function is mapped onto the form. Three types of mappings are involved: form-function, form-form and function-function mappings. Form-function mappings relate to the direct correlations between forms and functions. For example, the form of preverbal positioning in English is highly correlated with the function of expressing the actor role. The principle of direct mapping does not suggest that the relationships between form and function are based on a one to one relation. Rather, direct mapping means that it is possible for languages to incorporate on a single level cues that belong to different data types. In sentence comprehension, the parser attends to compounds or configurations of lexical semantic cues (for example, animacy), morphological cues (for example, agreement markers), word order cues (for example, preverbal position), and intonational cues (for example, contrastive stress). This is contrary to the modular theories in which each distinct data type is dealt with by a separate processor.

Form-form mappings refer to the correlations between forms themselves. Children are able to piece together form classes on the basis of the information they get when they see their co- occurrence. They do this by realizing the fact that things that act the same way in certain constructions also act the same way in other constructions. In fact, the child seems to be guided by two principles in deciding what to correlate with what (MacWhinney, 1987). One principle is that of semantic connectedness. The other is positional patterning. By noticing formal correlations between items that are positionally connected and semantically related, the learner comes to master the basic form-form correlations

of the language. Function-function mappings refer to the correlations between functions. These correlations follow the rules of the real world where certain things are likely to co-occur and arbitrary random co-occurrence of properties which do not follow the rules can be considered as the exception. MacWhinney (1987: 319) expatiates on the function- function mappings: a paradigm case of functional correlations takes place in the area of those functions that are connected to the subject and topic. Here, there is a natural correlation in the real world between a participant being an actor, and its also being an instigator, a mover, a first mover, a perpetrator, a supporter of the activity and a causer. At the same time this participant is likely to be definite, animate, willful, topical and foregrounded. All of these various functions are intensely confounded. In the language system function-function mappings, form-function mappings and form-form mappings are not independent of each other. Rather, these mappings work together in the form of "coalitions." MacWhinney (1987) suggests that "coalitions are groups of function-function correlations that are in turn correlated with groups of form correlations and form-function mappings" (p. 319). If we consider the coalition underlying the English "subject" we will come to know that "subject" is not a single, independent category or a symbol. Rather, it is a coalition of many-to-many mappings between the level of form (for example, nominative case marking, preverbal position, etc.) and the level of function (for example, agent of a transitive action, topic of an ongoing discourse, etc.).

The entries at the level of form may have "obligatory" devices like subject-verb agreement, and "optional" correlates like the tendency for subjects to be marked with definite articles. That is why the competition model suggests that there is no sharp line between obligatory rules and probabilistic tendencies (MacWhinney, 1987).

The unified competition model

To give a comprehensive account of first and second language acquisition, MacWhinney (2005a) suggests a unified model of language learning in which the mechanisms of L1 learning are subsumed under the mechanisms of L2 learning. MacWhinney (2005a) argues that although the competition model was not aimed at encompassing all aspects of first and second language acquisition, the core concepts of it can be expanded into a unified model to give a fuller account of language acquisition. Adopting the core competition model, the unified model holds that for the adult native speaker, cue strength is a direct function of cue validity. In the 'unified model', forms are stored in associative maps for syllables, lexical items, constructions and mental models.

Which form is to be selected is determined by cue strength within a competitive central syntactic processor

(MacWhinney, 2008). The 'unified competition model' introduces three new components of chunking, codes and resonance. In this model, learning is believed to be a resonant process that is dependent on buffering, chunking, and support to acquire new mappings (MacWhinney, 2005a).

Buffering

According to MacWhinney (2008), buffering allows for short-term storage of the material, so that the processor can compare the competing forms and take the consistent patterns as inputs for learning. Moreover, when learners can maintain words and constructions in short-term sentence memory, they can benefit from a wide range of additional learning and processing mechanisms. One of these remarkable processes is simultaneous translation. Those who are involved in simultaneous translation have developed the ability both to listen in one language and speak in the other in parallel, while at the same time they are involved in performing a complex mapping of the content of the input language to the quite different syntax of the output language. Some researchers argue that the very notion of simultaneous translation indicate the extent to which two languages can be co-activated for long periods of time (Spivey and Marian, 1999).

Codes

In order to account for bilingualism and L2 acquisition, it is essential to have a clear theory of code activation. According to the 'competition model', there are two components for the theory of code competition. The first one is the theory of transfer and the other is the theory of code interaction, which encompasses code selection, switching, and mixing. Resonance is believed to account for co-activation processes in both L2 learners and bilinguals. How a particular code at a particular moment during lexicalization is selected, is determined by factors such as activation from previous lexical items, the influence of lexical gaps and conversational cues that a listener offers (MacWhinney, 2005a).

Chunking

Chunking helps the learner to take two or more items that frequently go together and form a single automatic chunk out of them. It enables the learner to gain fluency through the integration of information between maps. Chunking has an important role in the acquisition of grammar. One of the difficulties second language learners have to deal with is mastering a complex set of inflectional patterns.

MacWhinney (2005a) holds that these difficulties appear when the learners fail to pick up large enough phrasal chunks. When L2 learners use chunking, they will benefit from the opportunity to infer the grammatical points from implicit generalization across stored chunks.

Resonance

The unified competition model holds that learning is the result of an interaction between each of the various subcomponents during the processes of competition and resonance (MacWhinney, 2005a). Resonance occurs as a result of the repeated co-activation of reciprocal connections. The increase in the set of resonant connections leads to the increase in the possibilities for cross-associations and mutual activations, so the language makes a coherent co-activating neural circuit. Resonance is also viewed as an important strategy available to adult learners, because it involves the establishment of a series of associative relations between words and meanings that enable the learner to record a clear image of the word until the relations are consolidated (MacWhinney, 2005b). The use of the keyword mnemonic or imagery method for learning new words can be examples for resonance.

Language transfer

According to the competition model, learners transfer their L1 processing strategies to their L2 acquisition. In general, the model claims that "whatever can transfer will" (MacWhinney, 2005a: 17). For simultaneous bilingual acquisition, it is believed that if the child's two languages are approximately equal in dominance or strength, they do not allow excessive transfer by generating enough system-internal resonance, but if one of them is remarkably weak, then it cannot create enough internal resonance to block occasional transfer. For L2 learners the situation is different and the first language is the dominating one (Tokowics and MacWhinney, 2005). To create resonance in L2, learners use some learning strategies which essentially concentrate on optimization of input, promotion of L2 resonance, and avoidance of destroying the input chunks (MacWhinney, 2005a). The learning of sentence processing cues in a second language is a gradual process which starts with L2 cue weight settings that are close to L1, and only gradually over time do these settings move towards and get adjusted to the native speaker's settings for L2.

Age-related effect

If we consider the 'critical period hypothesis' as the

default criterion for the deterioration of the language learning ability when a learner grows older, the competition model offers a different explanation for the declining process of language acquisition among older learners. It holds that the repeated use of L1 results in its entrenchment (MacWhinney 2005a, 2005b, 2008). The account which the 'competition model' offers predicts a gradual decline of L2 acquisition beginning as early as age five and extending through adulthood (MacWhinney, 2005b). It predicts no sudden drop, but rather a slow, gradual decline. The extent of this entrenchment varies across different linguistic areas. The strongest effect can be found in the area of phonology and the weakest in the area of lexicon, where the learner can still go on developing it throughout his life. To overcome the effect of the L1 entrenchment, MacWhinney (2008, p. 363) suggests "To overcome entrenchment, learners must rely on resonant processes that allow the fledgling L2 to resist the intrusions of L1, particularly in phonology."

Instruction and the competition model

MacWhinney (1997) states that the issue of pedagogical approaches to second language learning is one which has both theoretical and practical importance. He believes if a pedagogical approach is based on psycholinguistic data, it paves the way to elaborate both practice and theory in tandem. It seems that the competition model would be most in harmony with the following pedagogical principles:

- 1) Language should be learned in a context which provides the learner with maximal experiential grounding.
- 2) Early instruction should consist of simple, frequent forms.
- 3) Early training should focus on the restructuring of the *phonological* system in the context of computer-controlled exercises which encourages the learner to match his own productions to clear L2 samples.
- 4) Language elements should not be taught separately. In other words, neither grammar nor phonology should be taught apart from particular lexical forms. The instruction of grammar and phonological structures should be implemented in the context of the acquisition of new lexical items in simple syntactic frames.
- 5) As it was discussed before, the Competition Model holds that the 'transfer' from L1 is inevitable; therefore, instruction should be designed in such a way that it can maximize the positive effects of transfer and minimize the negative effects.
- 6) It seems that early in learning, there is an important role for 'rote' acquisition of forms. However, in the later stages, such rote learning should be deemphasized.
- 7) It is not necessary for the instructional process to include specifically the transfer or remapping strategies,

since students will automatically apply them. However, errors produced by the transfer of L1 lexical frames need to be clearly presented in terms of HyperText systems (MacWhinney, 1997).

8) Inevitably, the simplest transfer strategies will produce errors. However, it is recommended that teachers let the student first deal with difficult materials in comprehension, instead of attempting, initially, to generate, detect, and correct errors in production.

9) When the student move forward and progress, the goal of instruction should be gradually drawing the learners' attention to those aspects of language which had previously been ignored and pinpoint the areas where the students had the largest numbers of errors. One of the effective ways is to emphasize on 'error detection' and 'error correction' in later stages of L2 learning to prevent the fossilization of forms and mappings. This type of training should focus on 'functional restructuring'.

MacWhinney (1997) states that a complete instructional system includes tools which provide for error detection and offer the learner specific instruction designed to correct each error type. He also points out that based on the competition model, error-driven instruction should present and elaborate the L2 pattern which should compete with the learner error. Having such procedures (the generation of errors and the use of tools for correcting these errors) can supply us with the psycholinguistic data which help us gain insight into learner strategies and the relative efficacy of different instructional methods. Using structured methods such as fill in the blanks, matching, question-and-answer, dictionary exercises, translation, and error detection, we can elicit similar responses in a group of learners. These responses can be traced and used in a variety of experiments within the program. Collecting such psycholinguistic data will enable us to increasingly develop refined models of the learner and discover how the competition model works in the area of second language learning.

FINAL REMARKS

In addition to dealing with language processing, the Competition Model accounts for first language acquisition as well as the learning of second languages. The studies implemented within the framework of the Competition Model, have found empirical support for the predictions of a connectionist perspective, underscoring the role of transfer and interference in second language learning. The Competition Model regards L2 learning as a process of cue acquisition which, at the beginning relies heavily on transfer from L1 to L2. Although transfer is generally done across certain areas, such as the transfer of the

meanings underlying L1 words to L2 words, cues which are the strongest for the learner have the strongest transfer. In some cases simple transfer is blocked, in such cases as compensation, the learner adopts a set of strategies to get around this blockage by producing more complex re-mappings from L1 to L2. The pedagogical implications of the Competition Model advocate a context which provides the learner with maximal experiential grounding. In order to facilitate functional restructuring, it is important to gradually expose the learner to those structures that differentiate true L2 strategies from transferred L1 strategies. According to the Unified Competition Model language transfer is an inseparable part of the second language learning process; therefore, there is no sense trying to defeat it. Instead, it stresses the importance of guiding the learner through the period of transfer into a period of functional restructuring.

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