Mechanisms of Language Aquisition

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BRIAN MACWHINNEY

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6 Competition, Variation, and Language Learning

Italian & English

Elizabeth Bates
University of California, San Diego

Brian MacWhinney
Carnegie-Mellon University

The problem of accounting for the acquisition of language can be decomposed into two smaller problems: how to account for what is universal in language development and how to account for what is variable. We have seen a number of elegant and detailed accounts of universal processes in language acquisition. But these models have not yet taken seriously the existence of two significant aspects of variation in the acquisition process: *1.* variation across natural languages and *2.* variation between individual learners within a particular language. In this paper we discuss a model of language acquisition that has attempted to deal with the first type of variation. We then indicate how this model will have to be elaborated in order to deal with the second form of variation, i.e. variation between individual learners. The development of a detailed mechanistic account for variation is particularly important for those who are interested in a biologically-based theory of language learning. By looking at variation, we are addressing a fundamental issue in the biological sciences, the plasticity of developing systems. How many different forms can a biological system take under normal and abnormal conditions?

The data currently available (Slobin, 1985) provide little evidence for a single, universal sequence in the acquisition of basic grammatical forms. This means that, in order to construct a universalist account of the acquisition of grammar, one must introduce concepts that extract universal patterns out of what appear to be particularistic data. One way of doing this is to think in terms of the nativist concept of "parameter-setting" (e.g. Chomsky, 1982; Lightfoot, 1982). According to a parameter-setting analysis, natural languages vary too much in their basic structure to permit a definition of universals entirely in terms of some *intersect,* i.e. the set of structures that *every* language has to have. Rather than obeying categorical universals, languages are governed by "implicational uni-

versas," a pool of structural possiblities in which any choice carries important structural consequences of the "If X, then Y" variety. Each individual language has charted a path through this set of possibilities. However, given the many implicational constraints within the system, the total set of possible pathways is finite, and rather small. According to this view, language acquisition can be viewed as a process of the successive setting of parameters in a way that allows the system to live with the preordained consequences of each setting. Biology provides the universal parameters; language input triggers a set of constrained choices within that pool of possibilities.

The problem with parameter setting as a model of cross-language variation is that it predicts sudden and all-or-none decisions, carried out in a single specified order, with essentially no opportunity to turn back once a parameter is set. Furthermore, the model is based on the assumption that the adult "steady state" can be modelled in terms of the presence or absence of certain structural types. We will present cross-linguistic evidence to suggest that languages vary not only in their end points (as a parameter-setting theory would predict) but also in the initial hypotheses that children hold about their grammar. This evidence indicates that the sequence of "parameter testing" is apparently not universal. Furthermore, the passage from initial states to end states is a gradual one. Two competing tendencies may coexist for prolonged periods of time, cycling in and out as though the child were unable to make up her mind. Finally, the "steady state" reached by adults also contains patterns of statistical variation in the use of grammatical structures that cannot be captured by discrete rules. This kind of cross-linguistic variation is difficult to capture with an all-or-none model.

Recognizing many of the problems we have just noted, Pinker (this volume) attempts to modify the parameter-setting model by encoding the parameters themselves in probabilistic terms. But this approach underestimates the depth of the problem. Any model that rests exclusively on universalist principles will fail to provide veridical accounts of the variable facts of language acquisition. Any model that rests solely on variation would also fail to provide coherent explanations for universal patterns. What is needed, instead, are models that are fundamentally capable of expressing both the universal and the variable aspects of language acquisition.

We have called the model that we will be presenting the Competition Model. Like other data-driven, connectionist models, the Competition Model allows statistical properties of the input to play a major role in determining order of acquisition as well as the nature of the final state. In this way the fundamental mechanisms of the model provide us with a way of understanding variability in particular words, segments, or constructions. This emphasis on ways in which the organism can adapt to the shape of the input allows us to apply our model to the study of cross-linguistic variation.

The other major type of variation that we will consider is variation in the contour of the learning process. Here, the major source of variability is the child

herself. It has become increasingly clear in recent years that children can acquire English in radically different ways—at least in the early stages of language learning (Nelson, 1981; Bretherton, McNew, Snyder & Bates, 1983; Bates, Bretherton & Snyder, 1985). Furthermore, these differences are apparently not due to variation in the child's linguistic input, although environmental factors can serve to discourage or enhance a particular linguistic "style" once it becomes apparent (Nelson, 1973; Furrow & Nelson, 1984; Goldfield & Snow, in press). Bates et al. (1985) show that individual differences in language development can be brought about by the differential strength and/or differential timing of two or more underlying mechanisms responsible for language acquisition and language processing. We are thinking of dissociable processes as faculties in the sense of abilities or skills. For example, one child may have a well-developed faculty for memorizing strings with detailed phonology, whereas another child may make greater use of a faculty for analyzing these same strings into their component parts. Differences in the patterns of development between these two children can then be seen as a reflection of differential use of these basic faculties. One major goal of our work with the Competition Model is to delimit a set of fundamental processing mechanisms whose strength at a given point in development varies across learners in a way that can eventually be linked to fundamental differences between the learners.

In the first part of our paper, we will consider the treatment of data on cross-linguistic variation in language learning provided by the Competition Model. In the second part of the paper, we will consider evidence for individual variation in the acquisition of English. We will then consider some suggested modifications that could be added to the competition model or any other connectionist/lexicalist theory to account for these patterns of variation.

VARIATION ACROSS LANGUAGES

Here we will examine the problem of accounting for the details of the differences in the course of language acquisition between children learning different languages. We will provide a sketch of the Competition Model, with emphasis on the principle of cue validity and the predictions that it makes for cross-linguistic differences in language learning. Then we will present the cross-linguistic evidence for and against a simplistic version of the model leading to the postulation of two kinds of developmental constraints on cue validity: functional readiness and cue cost.

The Competition Model

The competition model is a particular instantiation of a general functionalist approach to language performance and language acquisition. As defined by

MacWhinney, Bates, and Kliegl (1984, p. 128), functionalism is the belief that "The forms of natural languages are created, governed, constrained, acquired and used in the service of communicative functions."

From this point of view functionalism is the natural alternative to theories that postulate a severe separation between form and function in the grammars of natural languages. The idea that grammars routinely and generally spawn and proliferate forms that play no role in facilitating communication is foreign to the functionalist position. While recognizing that some systems, such as the gender-case marking of German article declension, may have lost much of their original function, we believe that language works continually to find functions for forms that have lost their original use. There are, of course, many versions of the functionalist approach with different kinds of claims requiring different kinds of evidence:

- at the diachronic level where functions play a role in the evolution of a particular language,
- at the synchronic level where functions continue to constrain linguistic forms in real time comprehension and production,
- at the developmental level where children use communicative functions as a guide in the acquisition of forms,
- at the level of formal grammar where rules in the grammar make direct reference to semantic and pragmatic symbols.

The competition model makes functionalist claims at the first three of these four levels. In other words, it is not offered as a formal model of **linguistic competence** but rather as a model of **linguistic performance.** This concentration on performance has one particularly important implication: in modelling the differences among natural languages, our goal is to provide an explicit account not only for the kinds of discrete "yes or no" phenomena that play a role in traditional linguistic models but also for the probabilistic differences between natural languages that are observed in real-time language use. In other words, **we are focussing on cross-linguistic variation in the mapping between form and function in language comprehension, production and acquisition.**

Before we describe the current version of the competition model, let us first consider some illustrative contrasts between two of the languages that we have studied in greatest detail, Italian and English. We will concentrate on a small but very important aspect of the grammar: the structural phenomena associated with the form of "sentence subject" as they relate to basic functions such as agent/actor and patient/object.

In both Italian and English, the "basic" or pragmatically-neutral word order is Subject-Verb-Object (SVO). There are no case inflections to mark semantic relations, except for some remnants of case in the pronoun system (e.g., the

contrast between *I* and *me*). These are both Indo-European languages, and they share a large number of cognates and word-formation patterns. But despite such formal similarities, Italian and English behave quite differently in everyday use.

First of all, Italian permits a great deal of pragmatic variation in basic constituent order. In fact, every logical order of subject, verb and object can be found in informal speech. This is illustrated in the following excerpt from Bates, MacWhinney and Smith (1983):

1. SVO: lo mangerei un primo. (I would eat a first course.)
2. OSV: La pastasciutte Franco la prende sempre qui. (Pasta Franco it orders always here.)
3. VSO: Allora, mangio anche io la pastasciutte. (Well then, am eating also I pasta.)
4. VOS: Ha consigliato la lasagna qui Franco, no? (Has recommended the lasagna here Franco, no?)
5. OVS: No, la lasagna I'ha consigliata Elizabeth. (No, the lasagna it has recommended Elizabeth.)
6. SOV: Allora, io gli spaghetti prendo. (In that case, I the spaghetti am having.)

The flexibility of word order is compounded still further by the fact that Italian is a "pro-drop" language, i.e., a language in which subject omission is a perfectly legal and very common option (occurring in approximately 70% of the clauses in informal speech among adults, according to Bates, 1976). As a result, the most frequent form in Italian discourse is not SVO, but (S)VO or O(S)V. Given this combination of word order variation plus ellipsis, the identity of subject and object is not at all predictable in Italian by word order information alone.

How do Italians get away with such behavior? For one thing, they can often rely on a richly marked system of verb morphology to let them know "who did what to whom." This contrasts markedly with the degraded system of verb morphology in English, as illustrated below:

1. lo mangio. I eat.
2. Tu mangi. You-informal-singular eat.
3. Lui/Lei mangia. He/She/You-informal-singular eat.
4. Noi mangiamo. We eat.
5. Voi mangiate. You-informal-plural eat.
6. Loro mangiano. They/You-formal-plural eat.

In these present tense examples, the only available contrast in English is provided by the third person singular "'s." The other forms are entirely ambiguous.