USING COGNITIVE GRAMMAR, NATURAL PHONOLOGY, AND ITEM RESPONSE THEORY

TO EXPLAIN ESL SUBJECTS’ CONTROL OF THE [D] and [Z] MORPHEMES

Kyle Perkins and Sheila R. Brutten
Southern Illinois University
Carbondale, Illinois

INTRODUCTION

Our purpose in this paper is to apply selected notions from cognitive grammar, natural phonology, and item response theory in order to give better insight on ESL subjects' processing of the D and Z morphemes in English.

According to Nathan (1986) cognitive grammar (formerly sometimes known as space grammar) is a theory which has the intention of integrating human cognition, perception, and language into a more coherent view of the relationship between language and mind. At the moment Ronald Langacker and George Lakoff are the leading proponents of cognitive grammar. The aim of this approach, according to Nathan, is to define linguistic functions in cognitive terms. Nathan further explains the intention of these two linguistic approaches: "language structure in general is not significantly different from other aspects of human cognition, and ... constraints on the nature and functioning of cognition are reflected directly in the nature and functioning of human language" (p.3).

The following quote from Langacker (1982) details the units of description in cognitive grammar:

The grammar of a language, in space grammar terms, is simply a structured inventory of conventional linguistic units. For a given speaker, this inventory defines the boundaries of established linguistic convention as he knows it. Schematic units coexist in the grammar with content units that elaborate them; their relation is dynamic and interactive. On the one hand, a schema commonly derives from an array of previously established content units; extracting the schema amounts to perceiving the similarities which unite these units and abstracting away from their points of divergence. It should be noted that schemata are the only abstract descriptive units posited in space grammar. They are the functional equivalent of rules, and embody generalizations; but they are constrained in that they must always and only bear schematic relations to content structures (p. 25).
The thesis of Nathan's paper is that cognitive grammar nicely accommodates certain concepts in natural phonology, namely the notion of mental representation as physical space or embodiment and the notion of categorization by prototype. According to Nathan, natural phonology focuses on the mental nature of linguistic structures and any phonological processes to be included in a theory of natural phonology are intended to be real and to represent actual mental events. Phonemes are viewed as mental sound images which speakers perceive their language being composed of and as articulatory targets which speakers believe they are producing. Phonemes, then, are real sounds and embodied representations in mental space which combine the speaker's knowledge of the acoustic signal and the articulatory muscular movements which are necessary to produce the sound waves. A particular phoneme is composed of a class of sounds called allophones. All these allophones are classed as the same in terms of their commonality or their degree of similarity as prototypical members of a phoneme. The notion of the prototypical effects of allophones stems from the research of Eleanor Rosch (1973, 1977, 1978). Prototypical effects for the organization of allophonic and phonemic units in language have been demonstrated by Nathan, and Rosch has demonstrated their usefulness in the study of general cognition.

Using Nathan's work as a background, we propose in this paper the hypothesis that the morphemes D and Z are stored as mental embodiments of sounds, as articulatory/perceptual images. We further hypothesize that these morphemes are categorized as prototypes with their allomorphs conceptualized as a population of objects which can be considered in terms of their deviations from the prototype. The phonologically conditioned choice of allomorphs is accounted for by lenition, one class of phonological processes proposed by natural phonology. Lenition includes assimilation, deletion, and other related allomorphic processes that ease the transitions between contiguous sounds, that define permissible deletions of phones, and that make language pronounceable.

Our basis for these hypotheses is forgrounded in cognitive grammar and natural phonology. Natural phonology holds phonemes (and morphemes like D and Z) are mental images and embodied in mental space. Cognitive theorists believe that phonology is organized along the same lines as language in general: language is part of the human mind and is organized through central concepts such as physical imagery and prototype effects in categorization.

For the data analysis portion of the paper we have used item response theory (IRT). Hambleton and Swaminathan (1985) give a succinct definition of IRT.

Item response theory postulates that (a) examinee test performance can be predicted (or explained) by a set of factors called traits, latent traits or abilities, and (b) the relationship between examinee item performance and the set of traits assumed to be influencing item performance can be described by a monotonically increasing function called an item characteristic function. This function specifies that examinees with scores on the traits have higher expected probabilities for answering the item correctly than examinees with lower scores on the traits. In practice, it is common for users of item response theory to assume that there is one dominant factor or ability which explains performance. In the one-trait or one-dimensional model, the item characteristic function is called an item characteristic curve (ICC) and it provides the