Chapter 66

How Experiences with Words Supply All the Tools in the Toddler's Word–Learning Toolbox

Carmel Houston-Price
University of Reading, UK

Beth Law
University of Reading, UK

ABSTRACT

This chapter explores the resolution of Quine's word-learning conundrum: How young children identify the meanings of the words they hear in the utterances of expert language users. Various strategies are available to young word learners for solving this dilemma. The authors consider how the acquisition of each of these strategies might be underpinned by the same domain-general ability to detect and store associations between words and the environment in which they are heard. Drawing on examples of both socio-pragmatic and linguistic cues to words' meanings, they explore how the young child's early experiences with words might provide a platform for the discovery of more complex word-learning strategies, facilitating the learning of further new words. The chapter outlines specific predictions of the experience-driven model of the evolution of the toddler's word-learning toolkit that might be explored through experimental and/or computational investigations.

INTRODUCTION

The ease and speed with which infants acquire the vocabulary of the language in which they are raised is remarkable, given the complex problem that word learning presents. Consider the situation whereby an infant hears the sound "dog" in the presence of a dog. How does the child come to know that the sound is a word that refers to something in the world, and that this particular word refers to the animal rather than the person walking it, and more specifically, that it refers to the dog as a whole, rather than its tail, spotty coat or boisterousness? As Quine (1960) pointed

out, there are an infinite number of logical possibilities for each word's reference. One would, therefore, expect children's word learning to be slow and error-prone, but it is not. Between 16 and 24 months infants' productive vocabularies grow, on average, from 40 to 300 words (Fenson, et al., 1994) and at the peak of this vocabulary spurt nine new words are added to the lexicon each day (Bloom, 1973). How do infants solve the problem posed by word learning so readily?

Four types of solution to the Quinean conundrum have been proposed, each seeking to explain how the young word learner limits the hypothesis space generated by a new word to a more manageable size. Given that new words are often provided within sentence frames, the "syntactic bootstrapping hypothesis" proposes that children use information in the sentence structure to guide their interpretation of words (e.g. Gelman & Markman, 1985; Gleitman, 1990; Hall, Waxman, & Hurwitz, 1993; Katz, Baker, & Macnamara, 1974; Waxman & Booth, 2001). The social-pragmatic approach emphasises the communicative nature of word learning and argues that infants and young children draw on their understanding of the speaker's intentions and social cues such as the speaker's gaze direction to disambiguate new words (e.g. Baldwin, 1993; Bloom, 2000, 2002; Carpenter, Nagell, & Tomasello, 1998; Tomasello, 1995; Tomasello & Akhtar, 1995). A third perspective claims the existence of internally-generated constraints that bias infants to entertain only a subset of favoured hypotheses; thus, children assume that new words refer to entities without pre-existing names, to whole objects rather than parts or properties of objects, and to classes of objects that share the same shape or function (e.g. Golinkoff, Mervis, & Hirsh-Pasek, 1994; Landau, Smith, & Jones, 1988; Markman & Wachtel, 1988; Soja, Carey, & Spelke, 1991). Finally, some argue that domain-general perceptual, attentional, and learning mechanisms are sufficient to resolve the ambiguity inherent in word learning. As the environment directly presents the mappings to be acquired, infants need only apply their associative learning (Richards & Goldfarb, 1986; Smith, 2000a; Smith, Jones, & Landau, 1996; Smith & Yu, 2008) or invariance detection (Gogate & Hollich, 2010) mechanisms to identify the appropriate word-referent relations in this input.

While early research largely sought to establish the validity of each of these approaches in isolation, a more integrationist perspective has emerged over the past decade, reflecting the support in the literature for the availability of all four types of strategy to young children and the development of computational models demonstrating how multiple cues might converge to solve the mapping problem (Frank, Goodman, & Tenebaum, 2009; Siskind, 1996; Yu & Ballard, 2007). The Emergentist Coalition Model (Golinkoff & Hirsh-Pasek, 2006; Hollich, Hirsh-Pasek, & Golinkoff, 2000), the most fully-integrated description of word learning to date, proposes that infants draw on a range of attentional, social, and linguistic cues to reference and that the weighting of these cues changes during the second year: Thus, while the 12-month-old beginner is reliant on associative mechanisms, the 24-month-old 'expert' word learner is able to call on a full set of default assumptions, a sophisticated understanding of speaker intentionality and a growing knowledge of syntax to constrain the problem space surrounding new words (see also Woodward, 2000).

A perspective that has gathered considerable support in recent years argues that, although the various tools in the child's vocabulary-building toolkit are recruited at different points in development, they are underpinned by a common set of domain-general learning mechanisms (Plunkett, 1997; Smith, 2000a). There are several formulations of this approach, but all share the view that the word-learning environment supports infants' discovery of the cues that can be used to disambiguate words' mearnings. Thus, the 'Attentional Learning Account' (Colunga & Smith, 2008; Smith, 2000a) contends that the environment

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