Learning Words for Kinds: Generic Noun Phrases in Acquisition

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To appear in D. G. Hall & S. R. Waxman (Eds.), Weaving a lexicon. Cambridge, MA: MIT Press.

Acknowledgements. Support for writing this chapter was provided by NICHD Grant R01-HD36043. I am grateful to Sandeep Prasada and Bruce Mannheim for extremely helpful comments on an earlier draft.

Introduction

"Mommy sock." (Kathryn, age 1;9; L. Bloom, 1970)

"Tigers are bad." (Ross, age 2;9; MacWhinney, 1991)

Every language has the capacity to refer to kinds, with nouns such as "sock" and "tiger." Yet how nouns are used can vary considerably, as illustrated in the two sample sentences above. Whereas Allison's utterance refers to a particular member of a kind (one sock), Ross's refers to a kind construed more broadly (tigers in general). It is this second sort of expression that is the focus of the present chapter. Kind-referring expressions, such as "Tigers are bad," are also known as generics (Dahl, 1975; Carlson & Pelletier, 1995).

Generic noun phrases are expressed in English with multiple formal devices, including bare plurals (e.g., "Bats live in caves"), definite singulars (e.g., "The elephant is found in Africa and Asia"), and indefinite articles (e.g., "A male goose is called a gander"). What all these expressions have in common is a conceptual basis: they refer to a kind as a whole. Generics are interesting in the study of word learning for two primary – and seemingly contradictory – reasons: generic knowledge is vital to human reasoning, yet at the same time it presents a formidable induction problem for learners.

Centrality of generic knowledge. Kinds organize knowledge and guide inferences about the unknown. Recent psychological studies demonstrate that thinking about kinds leads people to make rich inferences about the world (e.g., Gelman & Markman, 1986; Gopnik & Meltzoff, 1997; Shipley, 1993). Once one learns that something is a member of a kind (for example, that a pterodactyl is a dinosaur), one tends to infer that the entity shares properties with others of the same kind (Gelman & Coley, 1990; Gelman & Markman, 1986, 1987). "Category-based" reasoning is predicated of kinds (Osherson, Smith, Wilkie, Lopez, & Shafir, 1990). More generally, "semantic" (vs. episodic) memory (e.g., Collins & Quillian, 1969) tends to be generic.

Furthermore, generics refer to qualities that are relatively essential, enduring, and timeless -- not accidental, transient, or tied to context (Lyons, 1977). Thus, generics imply that a category is a coherent, stable entity. However, unlike utterances containing universal quantifiers such as all, every, or each, generic statements allow for exceptions. Although a generic statement applies broadly to a category, it is not considered false by the presence of individual category members for whom the property does not apply (e.g., a dog who has lost a leg in an accident). In addition, generics may not even be true for a majority of category members (McCawley, 1981). For example, the generic statement "Birds lay eggs" persists, despite that it applies to less than half of the category of birds (excluding males and infants; Gelman, Coley, Rosengren, Hartman, & Pappas, 1998). As a result, facts stated generically may be particularly robust against counter-evidence. For example, whereas even a single counterexample would negate the generalization "All girls are bad at math," the generic statement "Girls are bad at math" can persist in the face of numerous counterexamples.

In sum, generic knowledge is foundational in human thought, including memory representations and category-based reasoning.

Induction problems posed by generics. Despite the importance of generic knowledge, generics pose two sorts of induction problems for learners. (a) When encountering any phenomenon (e.g., a child sees a picture in a book of two horses eating hay), how can the child know if this observation generalizes to others of the same kind? For example, do horses in general eat hay, or just the horses in this book? We refer to this as the problem of generic knowledge (see Prasada, 2000). The child must also determine which broader kind the generalization applies to. For example, is it more appropriate to infer that horses eat hay, that farm animals eat hay, or that animals eat hay? (b) A second, related inductive problem concerns language interpretation. When hearing an utterance, how can the child determine if the speaker has a generic interpretation in mind, or something else? For example, a caregiver may say to a child either “The horses are eating hay” or “Horses eat hay”. How is the child to figure out which utterance is kind-referring? We refer to this as the problem of generic language. Both induction problems must be solved for children to have a full understanding of generics.

What this chapter is about

This chapter concerns how generic noun phrases are acquired in early childhood. I first present in more detail the nature of the twin inductive puzzles that children face. I then review a series of studies demonstrating that, despite the challenging inductive burden, parents freely talk about generic kinds in their speech to young children, and children in turn readily acquire generic noun phrases by about 2-1/2 years of age. I then turn to the implications of these findings for broader theories of word-learning. Specifically, I put forth two speculative proposals: (1) Children exploit multiple sources of information (including powerful conceptual biases, formal morphosyntactic cues, contextual cues, and theory-based knowledge) to solve the problem of generic language. (2) Generic language is itself an important source of information that guides children as they work to solve the problem of generic knowledge. I will end by arguing that generics illustrate, in a microcosm, the importance of naïve theories in acquiring linguistic forms, and the importance of linguistic forms in informing naïve theories.

The inductive problems of generics

In this section, I lay out more explicitly the nature of the inductive problems posed by generics, focusing first on the problem of generic knowledge (which information to generalize, and to which kinds), and then on the problem of generic language (which utterances are kind-referring). This rather extensive preamble is important in order to highlight the depth of the puzzle that generics pose for a theory of acquisition.

Problem of generic knowledge

Prasada concisely states the problem of generic knowledge: "how do we acquire knowledge about kinds of things if we have experience with only a limited number of examples of the kinds in question?" (2000, p. 66). For example, how is it that we possess such rich and varied beliefs (horses eat hay; lima beans are detestable; Midwesterners are friendly; birds lay eggs; cars are expensive; etc.)? This knowledge cannot be reduced to knowledge of statistical regularities (Prasada, 2000). Certainly we have relatively little direct experience with the full set of instances of any of these kinds. In my life, I may have eaten lima beans no more than 10 times, yet I have a strong belief that lima beans – as a kind – are

detestable. Indeed, in some cases people have experience with only a single instance, yet generalize that information to the broader kind. What allows us to go from a sample of 10, or even 1, and to generalize to the kind as a whole (representing an untold multitude of instances)?

The problem of generic knowledge is all the more difficult in that counter-examples do not invalidate generic beliefs (McCawley, 1981). Thus, if I assert that Midwesterners are friendly, and you argue that they are not, I am not going to back down if confronted with the existence of an unfriendly Midwesterner. Certainly stereotypes (which typically entail generic beliefs about human kinds) persist despite little or no direct supporting evidence.

Note that frequent experience would not solve the problem. The induction problem would persist even if we had extensive experience with members of a kind, because no amount of personal experience or direct contact can give us access to the abstract kind in its entirety. Even in the case of, say, an endangered species with only 4 living exemplars on earth, experience with each and every existing instance would not give us access to the kind as a whole, because the kind includes past, future, and potential instances.

Indeed, I would claim that generics can never be displayed, except symbolically. Although one can talk about the distinction between a kind and members of a kind, one cannot directly demonstrate or illustrate the distinction. For example, although one can show a child one (specific) dog, one cannot show a child the generic class of dogs. Likewise, one can never demonstrate, with actual exemplars, photos, or drawings, the distinction between a generic kind (rabbits) vs. a plurality of instances (some rabbits). As Waxman (1999, p. 243) notes: "members of object categories are distinct, and often disparate, individuals that tend to appear at different times and places. … it would be logically impossible for caretakers to assemble together all members of an object category to model explicitly the extension of the category name." Thus, generic noun phrases exemplify in especially sharp relief the well-known induction problem discussed by Quine (1960) when considering naming.

The problem of generalizing from a particular example to a kind is compounded by ambiguity regarding which kind to consider. Each object is at once a member of a varied set of categories (e.g., the

same object is at once Marie, a cat, a pet, a mammal, a vertebrate, etc.), thus raising the question of how one selects the level of abstraction to which a property applies (e.g., the body temperature of your pet cat). Thus, the human capacity to generalize brings with it the question of how this capacity is constrained (Goodman, 1973).

In sum, although generic knowledge is a ubiquitous feature of human thought, it requires inferential leaps that extend beyond what we can know directly from our senses.

Problem of generic language

In addition to the conceptual issues raised above, the question of how children identify an utterance as generic is exacerbated by the complexity of mapping between formal and semantic cues. Simply put, there is no one-to-one mapping between form and meaning, in the case of English generics. Command of the generic/non-generic distinction in English requires, at the very least, morphosyntactic cues, contextual cues, and world knowledge. Thus, the use and interpretation of generics depend on a cluster of factors, all of which are important, but none of which are individually sufficient.

Morphosyntactic cues. In English, generics can be expressed with definite singulars, bare plurals, or indefinite singulars (Lyons, 1977):

a. The bird is a warm-blooded animal.

b. A cat has 9 lives.

c. Dinosaurs are extinct.

They can be contrasted with non-generic expressions such as the following:

d. The bird is flying.

e. A cat caught 2 mice.

f. There are dinosaurs in that museum.

g. The bears are huge.

Note that 3 of the 4 non-generic examples given above match the formal properties of the noun phrases in the generic examples (the exception being (g)). Thus, generics in English are not uniquely identified with a particular form of the noun phrase, but instead are cued by a variety of additional indications, including

the form of the verb. Specifically, there are at least four morphosyntactic cues that help a speaker identify an utterance as generic or non-generic: determiners, number (i.e., singular vs. plural), tense, and aspect.

Determiners and number jointly operate to indicate genericity. In English, a plural noun phrase preceded by the definite determiner (the) cannot be generic. For example, "Bears are huge" readily has a generic reading, but "The bears are huge" is not. Neither determiners nor number alone indicate whether or not a noun phrase is generic. However, it is the interaction of the two (i.e., definiteness plus plurality) that provides information regarding genericity. Aside from this restriction, generics can use definite or indefinite articles, can be singular or plural, and can include both naming expressions ("The elephant likes peanuts") and describing expressions ("A cat that has stomach trouble eats grass") (examples from Bhat, 1979, p. 139).

Tense is also an indication of genericity. With the exception of historic past (e.g., "Woolly mammoths roamed the earth many years ago"), past tense utterances are not generic. For example, we distinguish between "A cow says 'moo'" [generic] and "A cow said 'moo'" [non-generic]. Likewise, "The lion is ferocious" can have either a generic or a non-generic reading, whereas "The lion was ferocious" has only a non-generic reading. Finally, aspect is an important cue in English for distinguishing generic from non-generic interpretations. For example, a statement in the simple present, such as "Cats meow", is generic, whereas a statement in present progressive, such as "Cats are meowing", is non-generic.

Thus, in English, some of the formal cues relevant to whether a noun phrase is generic include articles, plurality, tense, and aspect. The cues can compete (e.g., "A cat caught two mice" has a potentially generic noun phrase but a decidedly non-generic verb), in this example with the non-generic verb winning out in the semantic interpretation. A striking example of how the cues interact can be seen with the following set of sentences:

- Do you like the mango? (specific)
- Do you like mango? (generic)

- Would you like mango? (indefinite ['some'])

Whether or not the noun phrase includes the determiner is not decisive, nor is the verb decisive. It is the combination of the determiner and the verb that is important. However, even here the formal cues are not entirely decisive, as can be seen when we consider "Would you like mango, if you were a monkey?" (in which "mango" could have a generic reading, even though the first portion is identical to the non-generic indefinite sentence). Thus, even when consider all formal cues simultaneously, they are insufficient to determine with any certainty whether a noun phrase is generic or not. This issue is elaborated below.

Contextual cues. Contextual cues are also central to the identification of generics. By this, I mean the construction of the sentence, as well as extra-sentential information that surrounds the utterance in discourse. Compare the two sentences that follow:

- Dingoes live in Australia.
- There are dingoes in Australia.

The first implies a generic reading, asserting of dingoes (as a kind) that they live in Australia. In contrast, the second implies a non-generic reading: some subset of dingoes live in Australia, others may live elsewhere. The relevant distinction here is neither the form of the noun phrase nor the tense or aspect of the verb, but rather the sentence construction.

A second sort of contextual cue involves the resolution of anaphoric references involving "they."

- "This is a tapir. They like to eat grubs."
- "These are my tapirs. They like to eat grubs."

The first "they" implies a generic reading (the class of tapirs); the second "they" implies a particular reading (my tapirs). In both cases, "they" refers to a plurality, but in the first example the plurality is one that is alluded to and inferred, rather than present in the immediate context. This rather subtle implication is one that children will need to master.

A further influence concerns the semantic context, as established by prior speech and knowledge. For example, consider the two rather fanciful scenarios below:

- Person #1: What color fur do blickets have?

  Person #2: A blicket has purple spots.

- Person #1: Something in this room has purple spots. What is it?

  Person #2: A blicket has purple spots.

Intuition suggests that a generic reading is more likely in the first case than in the second (which more powerfully supports an indefinite interpretation than a generic interpretation).

World knowledge cues. World knowledge can exert influences on generic interpretation, even when formal cues are kept constant. One major way is via the verb. For example, compare:

- I like rice.
- I want rice.

Whereas the first refers to a generic kind (rice), the second refers to an indefinite sample of the kind (equivalent to "some rice"). Indeed, note that "some" can be inserted in the second example without changing its meaning, but cannot be inserted in the first example without changing its meaning.

Likewise, the predicate can influence interpretation of the noun. Some predicates (e.g., "are extinct") require a generic reading. But the importance of semantic information is more widespread. Compare the following two sentences:

- A horse is vegetarian.
- A horse is sick.

Both examples have a noun phrase "a horse" that is indefinite singular; both have a predicate that is present non-progressive. However, whereas the first example could readily be interpreted as kind-referring (meaning that horses usually or ordinarily are vegetarian), the latter is unlikely to receive a generic reading. Being sick is (typically) predicated of individuals rather than of kinds.

Yet this is complicated even further by content knowledge. For example, "A pot is dirty" is unlikely to be interpreted as generic, yet "A pig is dirty" could very well be generic. The only distinction is that we know that pigs, as a class, are reputed to be dirty by their nature. We don't wish to suggest that

morphosyntactic cues are irrelevant here. For example, "Horses are sick" sounds odd, as the form pulls strongly for a generic reading whereas the content pulls strongly for a non-generic reading, leaving it difficult to interpret.

Tense, too, though a fairly reliable marker of whether an utterance is intended to be generic, is fallible. Historic past provides an exception to the generalization that generics are present tense. For example, "Saber-tooth tigers roamed the earth many years ago" is stated in the past because the species is extinct, but the utterance is still generic. We know this, again, by means of world knowledge.

Precisely which properties are interpreted as more or less generic is itself a non-trivial cognitive question that is beyond the scope of this paper. The point that is relevant here, and one to which I return in the conclusions, is that presumably the naïve theories that children and adults construct are important to making this determination.

Summary. A wealth of factors – including a cluster of morphosyntactic cues (regarding determiners, plurality, tense, and aspect), discourse context, world knowledge, and perhaps prosody – appear to determine whether an utterance receives a generic or non-generic reading by adults. In the final section we return to the question of why generics receive such varied expression. For now, this discussion highlights the daunting inductive task that children face in acquiring the means for producing and interpreting generics in English.

Empirical investigations of generic concepts and language

Do children have access to generic knowledge and generic language? The analysis provided above might seem to render the acquisition problem difficult or impossible. Indeed, it is at least theoretically possible that children would avoid the realm of generics until they reach an age when they can talk about all sorts of abstractions, such as 'freedom' or 'injustice.' But no – evidence is mounting that generics are basic to children's concepts. To preview our argument, we will suggest that early language-learners must have some sophisticated conceptual machinery to accomplish this.

We start with the notion of kind, which we take to be a prerequisite to generic understanding. There is some controversy concerning the age at which children first have a notion of kind (e.g., Xu &

Carey, 1996; Wilcox & Baillargeon, 1998; Balaban & Waxman, 1997; Mandler, 1992). Nonetheless, most investigators grant children a notion of kind by the time of their first words (at about 1 year of age). It is widely acknowledged that kinds are foundational to the use of sortal nouns (Macnamara, 1986), and that a distinction between kinds and other concepts (e.g., individuals, properties) underlies various linguistic form-class distinctions (e.g., proper vs. common nouns; Hall & Waxman, 1993; Markman, 1989). There is also excellent evidence that by 2 years of age children use syntactic information (e.g., "This is a zav" vs. "This is zav") to distinguish names for individuals from names for object categories (Hall, Lee, and Bélanger, in press; see also Katz, Baker, & Macnamara, 1974; Gelman & Taylor, 1984).

How about work focusing on kinds per se – i.e., generic knowledge? There is indirect evidence for early generic understanding by preschool age. Children as young as 3 or 4 years of age make kind-based inductive inferences, and even cite membership in the kind as justification for such inferences. For example, Gelman (1988) asked 4-year-old children to make novel inductive inferences concerning biologically relevant properties (e.g., eats alfalfa) from one item (e.g., a rabbit) to others either sharing kind membership (e.g., another rabbit; a dog) or not (e.g., a telephone). Children tended to justify inductions by citing the category membership of the items sharing the property (e.g., "Because it's a rabbit" or "Because it's an animal"). In contrast, they did not cite category membership when making inductions of non-generalizable properties (e.g., is cold). (See also Prasada, 2000, for discussion.) Kind-based inductions do not seem to be simply a matter of generalizing based on some other features that correlate with kind membership, because kind-based inferences are common even when the kind is posed in conflict with perceptual information (e.g., Gelman & Markman, 1986; Gelman & Coley, 1990). Furthermore, when pictures are unnamed, variations in the extent to which children make kind-based inferences can be linked directly to the extent to which children recognize that pictures belong to the same kind (Gelman & Markman, 1987).

More direct evidence for generic understanding and use focuses on interpretation and production of generic language. There are scattered examples in the literature – some anecdotal – that preschool children produce generics. For example, Shipley (1989) mentions that, in her studies, preschool children

(some as young as 3 years of age) referred to animal kinds with statements including: "Dogs go ruff-ruff and them have long tails" or "Animals can't talk" -- both of which are generic. Similar examples can be found in Adams and Bullock (1986) and Callanan (1990).

We have begun to look directly at generic comprehension and production in speech directed to children and in children's own speech. We review below 4 types of evidence: generics in parental speech, generics in children's speech (production), children's semantic interpretation of generics, and impact of generics on children's inductive inferences. The research endeavor is ongoing and the work opens up as many questions as it answers (some of which we mention in the concluding section). Nonetheless, the point I emphasize is that preschool children readily use and understand generic language. This in turn provides clues regarding the conceptual capacities of young children – a point to which I turn in the final section of the chapter.

Generics in parental speech

The question of input is important first to determine the frequency of generics in ordinary speech (particularly, speech that children are likely to hear). As past studies of generics have focused exclusively on linguistic and philosophical analyses, they have left wide open the question of how frequently (or conversely, how rarely) these expressions are produced. The psychological significance of generic language must rest in part on this issue. What we find (reviewed below) is that generics are surprisingly common in ordinary speech, with the vast majority of parents producing at least one generic during a brief interaction with their child.

Second, input data is critical for determining whether the sorts of inductive puzzles noted earlier still apply, in the speech that children hear. For example, if parents selectively use only one morphosyntactic form for signaling generics, if contextual cues aren't needed, etc., then this could be a means of simplifying the inductive puzzle for children. Instead, however, what we find, through a series of converging studies, is that parental input retains the complexity of mapping, thereby not greatly simplifying the inductive task that children face.

Third, a study of input language allows us to determine the contexts that elicit generic talk. I mean "contexts" loosely, to include domain, activity, and language. In part this is a purely logistical issue, as we wished to scout out the contexts that would most readily allow us to examine generics, in later studies focusing on children. But the contexts question is also of great theoretical interest, because it sheds light on how generic language is distinct from non-generic language.

Frequency in input. We first studied generics as one component of an intensive study examining how parents convey information about category structure, beyond simple labeling, during naturalistic interactions (Gelman, Coley, Rosengren, Hartman, & Pappas, 1998). Mothers and their 20- or 35-month-old children read picturebooks together. Sessions were videotaped and coded extensively for a variety of explicit and implicit talk and gestures concerning categories.

One key finding concerning generics is that they were surprisingly common in maternal speech. Nearly all of the mothers made at least one statement including a generic noun phrase during the brief picture-book reading session. Mothers used generics for both relatively familiar categories (e.g., "Kitty cats love to unravel yarn") and relatively unfamiliar categories (e.g., "A wok is how people in China cook. Well, actually, a wok is how people in America cook like Chinese people."). They talked about the category as a whole even when all they could see on the page was a single instance ("That's a chipmunk. And they eat the acorns."). In a follow-up project (Pappas & Gelman, 1998), mother-child pairs were videotaped while looking through a book of animal pictures. The data replicated the findings of Gelman, Coley, Rosengren, et al. (1998), with nearly every mother (92%) producing at least one generic during the brief book-reading session.

Complexity of form-function mapping. What about the mapping between form and function? This was complex even in maternal speech to these young children. One indication of complexity was that mothers used multiple forms to indicate generics, most commonly including bare plural (e.g., "Oh, how come cars don't, don't fly?"), plural pronoun ("'Cause they have a long nose"), and indefinite singular ("What's a chicken say?"). Thus, generics were not restricted to a single morphological type. Of the mothers who produced at least one generic, only 21% restricted themselves to only one or another of

these three forms. Moreover, even focusing just on the singular-plural distinction, we still find extensive variability in the forms produced: 47% of mothers produced both singular and plural forms within a single session, 34% produced plural forms only, and 18% produced singular forms only. Mothers at times even alternated between singular and plural within a sentence ("Did you know when a pig gets to be big, they're called hogs?"; "Bats are one of those animals that is awake all night").

A second indication of the complexity of the form/function mapping was that forms that were used generically were also used non-generically in the transcripts. Thus, for example, the indefinite plural was used both generically ("A chipmunk's a little smaller than a squirrel") and non-generically ("That's a chipmunk"). Likewise, the bare plural was used both generically ("Where do bats live?") and non-generically ("They are bats"). We noted only one respect in which the input does simplify the mapping problem for children: the definite singular form (e.g., "The anteater has a long tongue") was apparently never used. Altogether, these results indicate that the input does not solve the mapping problem for children.

Domain-specificity. A striking feature of mothers' generics in the Gelman et al. (1998) study is that they were domain-specific, appearing significantly more frequently for animals than artifacts. The domain differences in generic usage cannot be attributed to familiarity of the category, similarity among category members, thematic relatedness among category members, or amount of maternal talk. We controlled for similarity and thematic relatedness by selecting the stimulus materials from a larger set of items that were pretested on adults, and we controlled for familiarity and amount of talk by conducting analyses that took into consideration the amount of talk and maternal ratings of child familiarity. The domain differences are also unlikely to be attributable to lack of sufficient knowledge about the artifacts. Mothers certainly knew several category-general properties true of each artifact depicted (including its parts, function, thematic associates, and appearance), and mentioned many of these properties in reference to particular objects and contexts. Importantly, though, mothers typically failed to mention these properties in generic form.

Why, then, did animals elicit so many more generics than artifacts? We interpret this result as reflecting conceptual differences between animal and artifact categories. On the assumption that mothers construe animal kinds as more richly structured than artifact kinds (deeper similarities, greater coherence, etc.), they should more easily conceptualize animal categories as abstract wholes, and hence use generics.

Generics in Mandarin. Mandarin provides an interesting contrast to English, because it lacks three of the grammatical distinctions used to identify generics in English (articles, plurality, and tense). A fourth grammatical distinction (aspect) does not always appear in Mandarin, and is even ungrammatical with some verb types (Li & Bowerman, 1998). As a consequence, there are sentences in Mandarin that could be translated as either generic or non-generic in English (Krifka, 1995). For example, the following sentence:

xiao3	ya1zi	yao2yao2bai3bai3	de	zou3	lu4
little	duck	waddlingly	DE	walk	road

could be translated in any of 3 different ways:

g. The duck is waddling,

h. The ducks are waddling, or

i. Ducks waddle. / A duck waddles.

Only the third is generic. This does not mean that Mandarin fails to express generics. There are subtle semantic and pragmatic cues that may help clarify the status of an utterance (Krifka, 1995). For example, the absence of specific number, time, or place markers can imply a generic interpretation. Nonetheless, the absence of particular morphosyntactic cues such as articles, plurality, tense, and (sometimes) aspect, means that the expression of generics is less overt in Mandarin than English. Of course, as noted earlier, English generics are also detected in part on the basis of contextual cues, such as the absence of specific time and place markers. Thus, the marking of English generics is not wholly unambiguous, and the difference between English and Mandarin is a difference of degree rather than a qualitative difference.

There is in fact a longstanding but previously untested claim that these linguistic differences lead to corresponding conceptual differences in how speakers of Mandarin vs. English think about generic

kinds (Bloom, 1981; Moser, 1996). Bloom (1981) states the linguistic relativity hypothesis most starkly: "... the Chinese language does not have any mechanism ... with which to signal the generic concept ..." (p. 38). "Perhaps the fact that English has a distinct way of marking the generic concept plays an important role in leading English speakers, by contrast to their Chinese counterparts, to develop schemas specifically designed for creating extracted theoretical entities, such as the theoretical buffalo, and hence for coming to view and use such entities as supplementary elements of their cognitive worlds" (p. 36). Thus, Bloom's suggestion has two parts: (1) that generics have no means of expression in Chinese, and (2) that this linguistic difference leads to corresponding conceptual differences. Yet Bloom's evidence for this position was insufficient, on his own admission (p. 36), resting on a task that required Mandarin speakers to render a difficult metalinguistic judgment of a single sentence, with no comparison group of English speakers.

Twila Tardif and I conducted a cross-linguistic study of generic noun phrases, comparing speakers of English and of Mandarin who were videotaped in parent-child play sessions with identical contexts across languages (Gelman & Tardif, 1998). Our primary questions were whether generics could be identified in Mandarin, despite the cross-linguistic differences in how transparently they are expressed, and if so, how frequently they appear relative to English.

We gathered child-directed speech from English-speaking parents (in Ann Arbor, Michigan) and Mandarin-speaking parents (in Beijing, China) interacting with their 20-month-old children. All noun phrases (excluding pronouns, which are less frequent in Mandarin by virtue of the structure of the language) were coded in two ways: (a) as generic or non-generic, and (b) for domain. Sample generics included: 'Baby birds eat worms' [English] and 'da4 lao3shu3 yao3 bu4 yao3 ren2?' ('Do big rats bite people or not?') [Mandarin].

Despite very different formal devices for expressing generics, patterns were remarkably similar across languages. Generics were frequent in Mandarin as well as English (83% of the Mandarin-speaking mothers and 100% of the English-speaking mothers produced at least one during 30 minutes of play with their 20-month-olds). In both languages, generics were more frequently expressed for animals than for

other domains. Thus, the cross-linguistic similarities argue that generic concepts are robustly expressed in the speech to small children. Interestingly, however, generics were significantly more common in English than Mandarin, suggesting that language-specific differences in how transparently generics are marked may affect frequency of use.

Importantly, the distribution of generic noun phrases differed markedly from that of non-generic noun phrases in both languages, with generics used significantly more for animals than for artifacts, and non-generics used significantly more for artifacts than animals. Thus, domain differences in generic use cannot be due to differences in the salience of each domain. Moreover, there were no language differences in frequency of non-generics.

In sum, the results suggest an interaction between cognitive universals and language-specific effects. On the one hand, we argue for cross-cultural (perhaps universal) properties of generic concepts that are expressed with linguistically different constructions. On the other hand, the frequency of expression may be modified by the manner in which generics are expressed in the language. Moreover, the ambiguity of expression may have implications for how generics are interpreted and used in children learning Mandarin.

Contexts. The frequency with which mothers produce generics is highly sensitive to interactional context. Generics are consistently produced more frequently during a book-reading activity than during free play with toys. This can be seen most clearly in the data that Tardif and I gathered in English and Mandarin, where we systematically varied the play context. Mothers and children spent 10 minutes looking through a picturebook, 10 minutes playing with ordinary toys (e.g., blocks, stuffed animals), and 10 minutes play with mechanical toys, with the 3 activities presented in counterbalanced order. Book reading elicited generics at 5-10 times the rate at which they were produced during toy play. Pictures are more readily construed as representations than are real objects, even toys (DeLoache, 1991), and thus I speculate that they are more likely to encourage talk about the kinds that they represent. In contrast, toys are more readily construed as objects in their own right (even though in fact they are also representations), and thus more likely to encourage talk about the ongoing activity. Interestingly, the

book reading context is also one that elicits proportionately more nouns and fewer verbs, relative to the toy play contexts (Tardif, Gelman, & Xu, 1999). Thus, contexts that encourage nouns also seem to encourage generics, whereas contexts that encourage verbs also seem to correspond to a focus on in-the-moment activities. The important point here is that factors that sway the interpretation of an entity (as representing a kind vs. as an individual object) are associated with more vs. fewer generics.

Summary. Generics are highly frequent in ordinary child-directed speech. They appear early in development, being common in speech to children as young as 20 months of age – the youngest age we have studied. They are found in two languages that express generics quite differently (English and Mandarin). They also appropriately signal which kinds are more (vs. less) richly structured, as indicated by the context-sensitivity of their use: used more for animals than artifacts, and more in book-reading contexts than in toy-play contexts. But are they used by children? We turn to this question next.

Generics are produced early in development

In this section I describe the evidence to date for children's production of generic noun phrases in spontaneous speech. Natural language is a valuable vehicle for examining conceptual understanding in toddlers who are not capable of handling the complex information-processing demands of many experimental tasks (Bartsch & Wellman, 1995). I make two major points with these data: generics are produced as early as 2 years of age, though the frequency increases markedly between 2 and 3 years; and generics are distributed differently from non-generics by their earliest use, suggesting a nascent semantic distinction.

Frequency of generics in children's speech. Jonathan Flukes and I have analyzed data drawn from longitudinal transcripts in the CHILDES database organized by Brian MacWhinney and Catherine Snow (1990). *[footnote: We are grateful to Thomas Rodriguez for his assistance with CHILDES.]* The researchers who contributed the data were Lois Bloom (1970), Roger Brown (1973), Stan Kuczaj (1976), Brian MacWhinney (1991), Jacqueline Sachs (1983), and Catherine Snow (see MacWhinney, 1991). Subjects are 8 children (ages 2-4 years) followed longitudinally. We included only those files in which child MLUs were at least 2.5 for 3 taping sessions in a row, in order to ensure that children had command

of the appropriate syntactic devices (e.g., singular vs. plural). We examined all utterances containing plural nouns, mass nouns, and indefinite singular nouns (totaling nearly 45,000 utterances), and coded each in two ways: (1) as generic or non-generic, and (2) for domain (person/animal, artifact, other).

As can be seen in Table 1, children as young as 2 years of age spontaneously produced generics in everyday conversations, although the rate of generics production increased between 2 to 4 years of age. Overall, the 8 children we studied produced 3,096 generic noun phrases during the sessions recorded between ages 2 and 4 years.

Domain-specificity of generics in child speech. What independent evidence do we have that children use generics to refer to kinds as opposed to individual instances? The distribution of generics across domains is suggestive in this regard. Recall that mothers produced significantly more generics for animals vs. artifacts, even when we control for the frequency of talk in the two domains. Together with work suggesting that animal categories are more coherent structured than artifact categories (e.g., Gelman, 1988; Keil, 1989), this domain difference suggests that generics are reserved for talking about categories with particularly rich correlated structure.

Importantly, we find that children at each age also provided significantly more generics for animate kinds than for artifacts (see Table 1). Before concluding that children have an animacy bias, however, it is important to conduct an analysis of children's baseline speech. In other words, we need to make sure that children's animacy bias in generics is not simply due to an abundance of animate noun phrases overall. In order to address this question, we computed a proportion score for each domain that was the number of generic noun phrases in that domain divided by the number of total coded noun phrases in that domain. Thus, each subject's data serve as his or her own control. As shown in Table 1, even controlling for baseline frequencies of speech in each domain, there remained a strong preference for children to use generics for animates. This difference was significant even at age 2.

Generics are distributed differently from non-generics with respect to number. A second piece of evidence that generics are conceptually distinct from non-generics is found in an examination of how number (singular vs. plural) matches or mismatches nonlinguistic context. Recall that mothers

showed an occasional mismatch between the number of available category instances and the plurality of the noun phrase used (Gelman et al., 1998). Specifically, mothers at times used plural generics even when only a single instance was visible in the picture (e.g., "That's a chipmunk. And they eat the acorns"). Similarly, sometimes mothers shifted between singular and plural forms (e.g., "Did you know when a pig gets to be big, they're called hogs?"). This pattern is striking, because on the surface would appear to be a blatant error: reference to a single individual with a plural noun. However, we suggest that the "error" is in fact not an error at all, but rather reflects the semantics of generic nouns. Specifically, "they" in the chipmunk example refers not to the chipmunk identified in the previous sentence, but rather to chipmunks as an abstract kind. If our interpretation is correct, then these mismatches suggest that generics are not tied to a particular set of instances present in the immediate context but rather refer to the category as a larger whole.

Athina Pappas and I (Pappas & Gelman, 1998) designed a study to address how characteristic these mismatches are for generics, and whether they differ systematically from the use of non-generic noun phrases. It is possible, for example, that these mismatches reflect not the semantics of generics, but rather simply slips of the tongue. If that were the case, then non-generics should display as many number mismatches.

We asked mother-child dyads to look through picturebooks about animals. The books were specially created so that each page included either a single instance of a category (e.g., one crab) or multiple instances of a category (e.g., 12-15 crabs), thus manipulating contexts by varying the number of items on a page. The children ranging in age from 23-57 months.

I focus on the child data here, though the maternal data show the same patterns. We found that there were striking differences in how generics vs. non-generics were distributed, both in the speech of parents and in the speech of preschool children. Whereas the form of non-generic noun phrases was closely linked to the structure of the page (i.e., singular noun phrases were used more often when 1 instance was presented; plural noun phrases were used more often when multiple instances were presented), the form of generic noun phrases was independent of the information depicted (e.g., plural

noun phrases were as frequent when only 1 instance was presented as when multiple instances were presented). At times this led to the sort of "mismatches" described earlier. For example, after one mother referred to an individual ostrich as "ostrich," her child replied, "They stink." In fact, subjects were no more likely to access the larger category when presented with many instances than when presented with just one. That even a single instance of the category could serve to trigger a generic utterance suggests that subjects may be thinking about individual animals in two ways, both as individuals and as instantiations of a kind. We interpret the data as providing indirect evidence that generic noun phrases differ from non-generics in their semantic implications, both in the input to young children and in children's own speech.

Summary. Children produce generics fairly frequently by 3 years of age. Moreover, we have two indirect pieces of evidence suggesting that generics differ in their semantic implications from non-generics, for preschool children. First, whereas generics tend to be preferred for animates, there is no such preference for non-generics. Second, whereas non-generics tend to match the non-linguistic context in terms of number (singulars used in the context of a single picture, plurals used in the context of multiple instances), generics tend to be independent of the non-linguistic context (e.g., plurals used in the context of single instances as well as multiple instances) (Pappas & Gelman, 1998). This is what we would predict from a semantic analysis of generics, as their meaning is not tied to any depictable or present non-linguistic context.

Children assign appropriate semantic interpretation to generics

We turn now to more direct evidence concerning children's semantic interpretation of generic noun phrases. As noted earlier, there are 2 important semantic features of generics: (a) Generics are generally true, and so are distinguished from indefinites (e.g., "Bears live in caves" is generic; "I saw some bears in the cave" is indefinite). The distinction between a generic reading and an indefinite reading is particularly critical because the same form of the noun phrase can be used for both (e.g., "I like rice" (generic) vs. "I want rice" (non-generic, indefinite). (b) Generics need not be true of all members, and so

are distinguished from universal quantifiers (e.g., “all,” “every,” “each”). In a pair of studies described below, we examine whether children appreciate these features.

Generic scope: yes/no task. Michelle Hollander and I conducted a study that focused directly on what generics mean to young children, by examining their scope of application. As noted earlier, for adults, generics are distinctive in implying broad category scope (e.g., "Birds fly" is generally true of birds) yet allowing for exceptions (e.g., penguins). Thus, generics are distinct from both all (e.g., "All birds fly") and some (e.g., "Some birds fly"). We conducted an experiment to test whether preschool children appreciate this. The study was modeled after an experiment conducted by Smith (1980) which had focused on children’s interpretation of all" and "some." In Smith's study, children ages 4 to 7 years received a series of questions regarding properties of categories. One-third of the properties were true of all members of the category in question (what we call "wide-scope properties"); one-third were true of some members of the category (what we call "narrow-scope properties"); and one-third were true of no members of the category (what we call "irrelevant properties"). Children were asked about each category-property pairing with either the word "all" or the word "some" (e.g., "Do all girls have curly hair?" vs. "Do some girls have curly hair?"). Smith's results indicated that by age 4, children appropriately distinguished "all" and "some."

Hollander and I presented preschool children with three blocks of items each: generic, "all," and "some," in counterbalanced order. Each block included 3 kinds of properties: wide-scope properties (e.g., “Are fires hot?”), narrow-scope properties (e.g., “Do girls have curly hair?”), and irrelevant properties (e.g., “Do fish have branches?”). We predicted that children would treat generics as partly like "all" and partly like "some." In particular, we predicted that children would accept both "all" properties and (to a lesser extent) "some" properties as true in generic form.

Results confirmed our predictions. With the narrow-scope properties, 4-year-olds were more likely to answer “yes” in response to “some” and generic questions than in response to “all” questions. Furthermore, for both generic and "all" questions considered separately, children were more likely to affirm wide-scope properties than narrow-scope properties. In contrast, there was no significant

difference between wide- and narrow-scope properties for "some" questions. These results indicate that children interpret generics as being reducible to neither "all" nor "some." This is particularly notable given that the identical form of the noun phrase (bare plural) is used for indefinite utterances as well, but children did not confuse generic and indefinite.

Generic scope: elicited production task. Jon Star and I conducted a study similar in logic but differing in design. Here, 4-year-old children were asked to produce their own utterances, under the guise of giving information to Zorg, an alien puppet from outer space. The prompts children heard employed one of three kinds of cues: generic (e.g., "What can you tell Zorg about dogs?"), "all" (e.g., "What can you tell Zorg about all dogs?"), or "some" (e.g., "What can you tell Zorg about some dogs?"). An analogous paper-and-pencil version of the task was developed for adults.

Transcripts of the elicitation sessions were prepared, and an independent group of adults rated the frequency with which each property was true of the category in question. Adult raters were blind to the purpose of the ratings, to the linguistic prompts that were provided by the experimenter, and to the linguistic format in which the property was expressed. (So, for example, "some dogs are furry," "all dogs are furry," and "dogs are furry" would all be rendered as "are furry" for the adult raters.) The adult ratings for each property were then averaged, and we thus determined for each child subject, the mean rating assigned to the properties they generated, for each category.

Results indicated that both children and adults were sensitive to the linguistic prompts provided by the experimenter. For both 4-year-olds and adults, "all" was treated as widest in scope, "some" as narrowest in scope, and generics as intermediate, with significant differences between the 3 wording conditions.

Generics constrain children's inductive inferences

We hypothesized that generic language would provide a rich source of information to children concerning the potential scope of inductive inferences. Jon Star, Jonathan Flukes, and I conducted a study to examine whether and how children make use of information in generics as compared to other linguistic expressions to direct their inductions (Gelman, Star, & Flukes, in press).

Preschool children (mean age 4 years, 7 months) and adults participated in the study. We presented a series of animal categories, one at a time. For each page there was a target question (e.g., for the category "bears," the question page said, "Which ones like to eat ants?"). There were 6 pictures to choose from. Children first received a clue to help them answer the question. The clues varied in linguistic form, for example: "All bears like to eat ants," "Some bears like to eat ants," or "Bears like to eat ants" (generic). Across items, the wording was varied within subjects.

The results indicated that the induction rates for the "all," generic, and "some" conditions were all significantly different from one another, although these differences interacted by age. Both children and adults were sensitive to the wording in the inferences that they drew. For adults, generics were treated as equivalent to "all," whereas for children, generics were treated as less powerful than "all" but more powerful than "some." However, a follow-up study using a more sensitive measure indicated that adults (like 4-year-olds) do recognize a distinction between the inductive potential of "all" and the inductive potential of generics.

Summary. The findings reviewed above argue for an early-emerging capacity to produce and interpret generics, and by extension, to readily consider and converse about abstract classes of entities. These findings argue for an early-emerging capacity to produce and interpret generics, and by extension, to readily consider and converse about abstract classes of entities. What sort of cognitive and/or linguistic capabilities could support the sustained interest in and ease with generics, found here? We turn to this issue in the following section.

Implications for developmental mechanisms

In this section we address two questions: (1) How do children solve the inductive puzzle of generic language? (2) Which is primary, generic concepts or generic language?

How do children solve the inductive puzzle of generic language?

The expression of generic kinds in language must be learned in childhood: It is not innate (as seen by cross-linguistic variation), yet it is available within the first few years of life. What is the acquisitional process? I have already argued rather extensively that adults use multiple sorts of

information to identify an utterance as generic or not. It is still an open question as to which of these cues children make use of, and at what ages. Relevant data would include information regarding: which formal cues children are sensitive to, including verb tense and aspect, and noun morphology (e.g., do they distinguish "What color are dogs?" (generic) from "What color are the dogs?" (non-generic)), which contextual cues children use (e.g., do they distinguish "Here's a blicket; they live in trees" (generic) from "Here are two blickets; they live in trees" (non-generic)), and which knowledge cues they use (e.g., do they distinguish "I like rice" (generic) from "I want rice" (non-generic)).

In the absence of such data, we can nonetheless draw inferences regarding the sorts of capacities children are likely to be using. Specifically, I will suggest that the acquisition of generics cannot be explained in terms of simple associationist theories, but instead requires that young children make use of naïve theories.

Problems with DAM models. Smith, Jones, and Landau (1996) have proposed that "dumb attentional mechanisms" (henceforth "DAMs") can account for early word learning. The Smith proposal is that children keep a statistical tally of formal linguistic cues as they match to real-world features. Children then come to expect certain properties to co-occur with specific linguistic frames. "In learning language, children repeatedly experience specific linguistic contexts (e.g., 'This is a _____' or 'This is some _____') with attention to specific object properties and clusters of properties (e.g., shape or color plus texture). Thus, by this view, these linguistic contexts come to serve as cues that automatically control attention" (Smith et al., 1996, p. 145). This is an automatic, associative mechanism that operates independently of reflective thought. Or, to rephrase in colloquial English, the child over time "soaks in" the statistical regularities present in the input. Smith et al. stress the importance of concrete properties in the process of word use and interpretation. To quote: (p. 144) "young children's naming of objects is principally a matter of mapping words to selected perceptual properties."

This sort of theory has numerous appeals. Most notably, it proposes a very general mechanism to explain a wide range of data; it relies on well-known and well-studied cognitive principles (such as implicit learning of statistical regularities); it is a developmental account (attempting to account for

developmental change, placing few demands on children, and not assuming that knowledge is built-in); and it is sensitive to phenomena such as cross-linguistic variability.

However, this DAM view, I suggest, cannot account for the acquisition of the generic-nongeneric distinction. *[footnote: More generally, I also argue that the DAM position cannot account for other aspects of word learning (Gelman & Diesendruck, 1999; Gelman & Koenig, in press; see also Bloom, 2000).]* Specifically, there are two major problems with proposing that children are detecting correlations between linguistic cues and concrete perceptual properties, when learning generics. First and most obviously, there are no concrete perceptual properties associated with an utterance being generic. Even if there were concrete properties that correspond to the base word (e.g., perhaps 'apple' is associated with a round shape; but see Gelman & Diesendruck, 1999, for counterarguments), certainly no such concrete perceptual properties signal whether the conceptual representation is generic vs. non-generic. This is an important point. To illustrate, consider the mother who solicitously asks her 2-year-old, "Do you like the mango?" as the child is tasting mango for the first time. Now consider a second mother who solicitously asks her 2-year-old, "Do you like mango?" as the child is tasting mango for the first time. The non-linguistic contexts are identical; the conceptual implications are quite different.

The second problem with the DAM approach, in this context, is that there is no 1:1 mapping between linguistic form and meaning – even for young children. Indeed, there is nothing even approaching a 1:1 mapping. Two-year-olds in our analyses use multiple forms for generics (singular noun with determiner 'a', mass noun, bare plural noun, pronouns), and each of these forms is used for both generic and non-generic utterances (e.g., sometimes bare plurals are generic, sometimes bare plurals are indefinite; the same is true of "a" plus singular noun).

A proponent of the DAM view might propose that children are instead attending to a multiplicity of cues "out there" in the input language and situation – not 1:1 cues, but perhaps a grid of cues that, taken together, signal genericity to the child. For example, perhaps determiners, number, tense, aspect, and prosody together form the relevant linguistic cues. The problem here is that the simplicity and on-the-face plausibility of the DAM approach decreases as the complexity of the cues increase. Is it possible

for the child to track and store all of these combinations of cues over time? And how does the child know in advance that these are the cues to attend to? In order to do so, must the child consider all available linguistic distinctions? The combinatorial demands on processing are formidable. But even were these problems to be solved, we would still be left trying to come up with a possible set of nonlinguistic contexts that would be "associated" with these cues. In the absence of a specific proposal of how this would work (along the lines of the proposed count noun/mass noun distinction supplied in Smith et al., 1996), it is difficult to accept – or even evaluate – such a possibility.

At the very least, the analysis of generics provided in this chapter greatly complicates the question of how one would implement an acquisitional process that depends on DAMs. I am skeptical that such an analysis is possible.

An alternative proposal: Multiple cues and naïve theories. Before sketching out my proposal, I first take a brief detour to ask why generics are marked in such a complex and subtle manner. Put a different way: If generics are so important, why don't they receive a single, unambiguous marker in English (or other languages)? The reason, I suggest, is that generics are marked more by their absence than by their presence. By this I mean that generic interpretations result when utterances are neither particular nor indefinite. There are many devices in language for indicating that something is particular, and it would be extraordinarily difficult (perhaps impossible) to enumerate them all. These include: form of the determiner; precise number; deictics (including pointing); tense. All of these devices serve to locate an utterance within an identifiable context (this place, that time, those entities). Generics contrast with specific utterances in that they cannot be pinned down to a context – they hold generally over time and situations. Thus, there is not a limited set of features or contexts that correspond to the set of generic utterances. Rather, language-users assume that an utterance is generic unless that interpretation is blocked – and there are many ways to block it. Indeed, the more cues a speaker has at her command, the better. Thus, multiple sources of information – including naïve theories – are required, given how generics work.

This view could also help explain how generics are learned in languages that do not make use of determiners, tense, etc. Speakers in languages such as Mandarin still map a generic/non-generic distinction onto utterances, but they are using non-morphological cues to identify specificity and resolve ambiguity. In that sense, English and Mandarin are not so different from one another. It would be interesting to know how generally this analysis applies across languages.

What are the implications of this view for acquisition? In learning generics (at least in English), the child's task is not to acquire a particular form, nor to map one formal set of cues onto a set of properties in the world (à la DAMs). Rather, the child's task is to filter out the specific. This can be done most successfully by considering multiple cues, given the breadth and variety of means of indicating specificity. Such cues would at the least include morphosyntactic information and theory-based inferences. Presumably it also involves mastery of prosodic cues (e.g., stress on different words; see earlier example), and conventions of discourse (e.g., governing the examples of anaphora given earlier). Given how readily children grasp generics early in life, and the ease with which children produce generics in multiple syntactic forms, it would appear that even young children are likewise forming a mental model of the utterance as an integrated whole, to determine if there is any indication of specificity. Any indication of specificity could be enough to block a generic interpretation.

Another prediction is that as soon as a child learns that a particular cue marks an utterance as specific, she will readily recruit that information to mark an utterance as non-generic. For example, the determiner "the" powerfully guides adult speakers toward non-generic interpretations (in most cases, though as noted earlier, there are exceptions, such as 'The early bird catches the worm'). Tardif and I (Gelman & Tardif, 1998, Study 3) found that 91% of an adult English-speaking sample interpreted "The tractor doesn't have a nose" (emphasis added) as non-generic, whereas only 22% of the adult Mandarin-speaking sample did so. Interestingly, children distinguish definite from indefinite (using "the" vs. "a") by 3 years of age (Maratsos, 1974). I predict that children can likewise recruit this distinction for differentiating generic from non-generic utterances. Specifically, if one were to conduct a microgenetic study (Siegler & Crowley, 1991) examining the use of determiners to mark definiteness and to mark

genericity, one would find that children immediately extend the distinction to generics as soon as the definite/indefinite distinction is mastered. Their knowledge that the determiner "the" is specific should lead children to assume that definite noun phrases cannot be generic. Consistent with this prediction, is that children do not at first use definite singulars ("The early bird catches the worm") as generic.

Thus, my position is that acquisition of the generic system in English requires a theory-driven assessment of when an utterance picks out specific referents, and when an utterance does not. Thus, in addition to formal cues, conceptual analyses are highly relevant. For example, when "wanting" something, one seeks a portion or subset, whereas when "liking" something, one is (at least capable of) liking the class as a whole. As Callanan notes (1990, p. 106): "Children's inferential abilities are likely to develop from a complex interaction among their theories and expectations about the properties and categories involved, the knowledge they gain through their senses, and the knowledge they gain through verbal descriptions (most notably provided by parents)." The same is true of generics. In future work it will be of interest to explore these interactions among different sources of knowledge.

In contrast, if children at first look for just a single form to mark generics (e.g., using just singular, or just plural, or using indefinite determiners either just for indefinites, or using them just for generics), this would argue against my position. However, the suggestion that children use multiple cues does not imply that children use all the information adults do. Presumably adults have access to a richer set of linguistic and pragmatic skills to mark an utterance as generic or non-generic, and we suspect that developing this full set of skills will be a time-intensive and gradual process.

Which is primary: generic concepts or generic language?

I turn now to the question of whether generic concepts come first, or generic language comes first. On the "concept-first" view, the conceptual notion of kind arises non-linguistically, with generic noun phrases merely reflecting this conceptual structure. On this view, children possess an innate or early-emerging notion of kind (e.g., Gopnik & Meltzoff, 1997; Macnamara, 1986) as well as a rich reserve of non-linguistic generic knowledge, and generic language merely reflects and expresses this conceptual knowledge. Alternatively, the "language-first" view proposes that generic language plays a

role in the formation of kind concepts. In its strongest version, generic knowledge does not exist except for language. A. Bloom's (1981) analysis of generics in Mandarin vs. English would fall within this position. Xu and Carey's (1996) work on kind concepts, though not focused on generics, also argues for a formative role of language (check; maybe delete this ref or move as support to language playing a role).

In contrast, I strongly suspect that both directions of influence are critical. Thus, generics are indeed a reflection of children's early-developing, pre-linguistic notion of kinds, but generic language also provides input to this understanding.

Prelinguistic kind concepts. There are several pieces of evidence that kind concepts (generically construed) emerge very early in development, and are likely not to require linguistic instantiation. First, the apparently universal capacity for generics, despite widely varying linguistic forms, at least suggests that generics are a robust form of thinking and knowing about the world (Carlson & Pelletier, 1995). Second and more directly, prelinguistic infants engage in categorizing and inductive inferences that suggest they are appealing to generic kinds. Infants as young as 9 months of age are capable of extending novel words from one category instance to another (Waxman, 1999). Likewise, 9-month-olds generalize novel properties from one instance of a kind to another (Baldwin, Markman, & Melartin, 1993). For example, when shown a box that unexpectedly produces a sound, they attempt to elicit the same property in another box similar in appearance.

We cannot say for sure whether such generalizations are generic at this age – that is, they could consist of similarity-based generalizations from one instance to another instance rather than generalizations that derive from the generic class. (See also Rovee-Collier, 1993, for similarity-based inferences even much earlier in infancy.) However, we do know that by 2-1/2 years of age such generalizations are kind-based, as the information about kinds overrides the outward appearances of the individual objects in consideration (Gelman & Coley, 1990). For example, a 2-year-old will generalize from a brontosaurus to a pterodactyl, though only after learning that the pterodactyl is a dinosaur. Altogether, this work suggests that it is likely that there exists a pre-linguistic notion of generic kind that

guides children's inferences and knowledge organization (but see Xu & Carey, 1996, for an alternative position).

Effects of generic language. Although language is not determinative of kinds, generic knowledge is not wholly independent of language, either. At the very least, language has two functions that affect children's kind concepts:

(1) Naming serves to identify which entities belongs to a kind (through use of nouns; e.g., allowing one to identify a pterodactyl as a dinosaur – this is particularly relevant in borderline or atypical cases, in which a nonlinguistic analysis might diverge from labeling). This information guides category-wide (generic) inferences, as noted earlier. Furthermore, Waxman (1999; Waxman & Markow, 1995) make the intriguing suggestion that words serve as "invitations to form categories." As Waxman suggests: "Words focus infants' attention on commonalities among objects, highlighting these especially in cases where the perceptual or conceptual similarities may not be as apparent as at the basic, or folk-generic, level. … This can have dramatic consequences, inviting the child to notice deeper and more subtle commonalities than those that served as the initial basis of the grouping. In this way, naming may itself help to advance the child beyond perceptible commonalities among objects, pointing them toward a richer appreciation of the deeper, nonperceptible commonalities that characterize human concepts" (1999, p. 269).

(2) Generics are effective in teaching children particular category-wide generalizations, such as specific facts about the attributes of category members (Gelman, Star, & Flukes, in press). For example, by means of generic noun phrases, children learn particular facts about the physical characteristics, eating habits, behaviors, etc. of animals. When such properties are stated generically, they may become more central to children's conceptual representations than if they had been stated non-generically. Furthermore, because these facts are stated generically (rather than as universal quantifiers), they may be particularly robust against counter-evidence (e.g., "birds fly" allows for penguins, whereas "all birds fly" does not). Thus, even erroneous properties stated generically, such as stereotypes concerning gender or race, may be

more difficult to counter and erase than erroneous properties stated absolutely. This possibility has yet to be tested.

I would argue that these two functions of language cannot be expressed without language. There is simply no unambiguous way to carry out either function, without words for things. For example, it is difficult to imagine how a non-linguistic species could convey that a legless lizard really is a lizard, even though it looks outwardly just like a snake. With language, however, such a concept is elegantly expressed (e.g., "This is a lizard"). Likewise, no process of enumerating and displaying examples can unambiguously convey that birds (as a kind) have hollow bones, whereas this is an uncomplicated linguistic effort. Given the relevance of these functions for induction and category-based reasoning, given the relative ease of conveying these functions via language, and given the difficulty of expressing them by non-linguistic means, there is reason to suspect that language plays a role in the structure of people's categories.

In addition to these two demonstrated functions of language, generics may have two further implications – although this remains untested at the moment. They are briefly discussed below, as (3) and (4).

(3) A third potential function of generics may be to imply that members of a category are alike in important ways, even beyond the particular properties mentioned in the generic statements. In other words, hearing numerous generic statements about a category may lead children to treat this category as one about which indefinitely many category-wide generalizations could be made. In short, we suggest that hearing generics may lead children to make inferences regarding the structure of the category. If this is true, then generics may serve this function even when the information is relatively superficial (e.g., "Little rabbits are called kits"), or when little or no new information is provided (e.g., with questions, such as "How do they [bats] sleep?"), because the generic form itself implies that category members are importantly alike. If so, then there should be measurable effects of introducing novel categories with generics vs. non-generics.

Shipley (1993) likewise proposed that a grouping becomes a "kind" (i.e., richly structured, inference-promoting) when a person "projects a property onto individual members of a class" (p. 270). In other words, when a person learns a new property of a category as a whole, that category is hypothesized to cohere in novel ways. "Birds lay eggs" can be understood to mean "Birds are a kind of animal such that the mature female lays eggs" (Shipley, 1993). Shipley proposes that such a generic statement, "which presupposes the conceptualization of the class of birds as a single entity, should enhance the psychological coherence of the class of birds for that reason" (1993, p. 278). For example, the child may then hypothesize that she can make numerous other novel inferences about the class of birds. This possibility has not yet been tested, and remains a question for future research.

(4) A final speculation regarding the cognitive implications of generics, is that the amount of generic talk overall may foster or inhibit essentialist reasoning. That is, variation in frequency of generic expression (whether it be individual, or correlated with some other factor such as language or culture) could conceivably influence essentializing more broadly. Consider a child who hears plenty of kind terms, but exclusively in reference to individuals (“Here’s a soft kitty,” “Baby Ben can’t use that cup yet,” “Those flowers could use some water”). Now consider a child who hears plenty of kind terms, but with generics mixed liberally in (“Kitties are so soft,” “Baby Ben can’t use cups yet,” “Flowers need water.”).

Although we have no evidence either to confirm or disconfirm this hypothesis, I have observed striking individual variation in generic frequency, in both adults and children. In the CHILDES data, for example, the rate at which children produced generics at age 2 ranged from 0.13% of all utterances to nearly 3%, and at age 3, the rates varied from 0.30% to 6.39%. Individual differences are even more noticeable in the semi-structured book-reading tasks. Tina Pappas and I found that, in a controlled book-reading context where each mother-child dyad was talking about the very same book, the rate of maternal generics ranged from those who produced no generics whatsoever, to one mother who produced generics on an average of 41% of all utterances (Pappas & Gelman, 1998). Likewise, in an ongoing project examining generics concerning gender categories, the rate of maternal generics ranged from those who produced no generics, to one mother who produced generics on 67% of all on-task utterances (Gelman,

Nguyen, & Taylor, 2001). Even more remarkably, in the same study, children ranged from one who produced no generics, to another who produced generics on 92% of all on-task utterances!

At this point we know almost nothing about the nature and source of these massive individual differences. Are they stable over time? Are they stable over contexts? For example, does the child who produces many gender-focused generics – when looking through a book about gender – also produce many animal-focused generics, in a context that allows for such? If stable individual differences exist, do they reflect differential tendencies to focus on kinds, or to attribute immutable essences to categories? It would be intriguing to correlate individual differences in generics with score on an essentialism scale (e.g., Haslam, Rothschild, & Ernst, 2000). These questions await future research.

Conclusion

These studies describe the first systematic studies of generics in children. They are revealing about kind concepts in early childhood, beginning with children's earliest sentences. Generics illustrate, in a microcosm, the importance of naïve theories in acquiring linguistic forms, and the importance of linguistic forms in informing naïve theories.

Learning words is not like solving a jigsaw puzzle, where formal cues give you some pieces, and world knowledge and pragmatics are other pieces that can be added in earlier or later. Rather, the word learning process is akin to the creation of a tapestry with warp and weft together constituting the textile. In this very important sense, the child "weaves" a lexicon.

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Table 1. Relative frequency of generic noun phrases in the naturally occuring speech of children in the CHILDES database, as mean percentage of total utterances, and as mean percentage of searched utterances (mass nouns, plural nouns, and indefinite singular nouns only) within each domain.

	Age 2	Age 3	Age 4
	(N = 6)	(N = 8)	(N = 6)
Generics as mean percent of total utterances			
Animates	**0.33%**	**1.24%**	**1.82%**
Artifacts	0.12	0.37	0.59
Other	0.39	0.57	0.77
TOTAL	0.83	2.17	3.18
Generics as mean percent of searched utterances within each domain			
Animates	**4.52%**	**9.69%**	**13.05%**
Artifacts	1.64	3.91	7.83
Other	3.20	4.56	5.01
Total number of generics	361	1,563	1,172