

Beyond Fast Mapping: Young Children's Extensions of Novel Words and Novel Facts

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L. Markson and P. Bloom (1997) concluded that there was evidence against a dedicated system for word learning on the basis of their finding that children remembered a novel word and a novel fact equally well. However, a word-learning system involves more than recognition memory; it must also provide a means to guide the extension of words to additional exemplars, and words and facts may differ with regard to extendibility. Two studies are reported in which 2–4-year-old children learned novel words and novel facts for unfamiliar objects and then were asked to extend the words and facts to additional exemplars of the training objects. In both studies, children extended the novel word to significantly more category members than they extended the novel fact. The results show that by 2 years of age, children honor the necessary extendibility of novel count nouns but are uncertain about the extendibility of arbitrary facts.

Over the past 20 years, word learning has been characterized frequently as a difficult or even an intractable inductive task. Quine (1960) and others have argued that a word heard for the first time by a child has a multitude of possible meanings. However, children learn words quickly and have very large vocabularies by the time they enter formal schooling (see, e.g., Carey, 1978).

In order to resolve this apparent paradox between the difficulty of the word-learning task and children's relative ease in learning words, researchers have argued frequently that children use domain-specific word-learning mechanisms (e.g., Behrend, 1990; Markman, 1989). These mechanisms operate by limiting or constraining the number and type of possible word-to-world mappings that the child will consider when exposed to a novel word, thereby reducing these possible mappings sufficiently to enable the child to make a complete and accurate initial guess about the new word's meaning. In this manner, constraints are seen as an integral component of children's rather remarkable early word-learning skills (see Woodward & Markman, 1998, for a recent comprehensive review).

Despite much empirical support demonstrating children's use of word-learning strategies, the constraints (Behrend, 1990; Markman, 1989) or lexical principles (Golinkoff, Mervis, & Hirsh-Pasek, 1994) approach to word learning has been criticized in

recent years on both empirical and theoretical grounds. First, it has been shown that children's use of word-learning strategies varies across tasks (e.g., Tomasello & Akhtar, 1995) and across languages (e.g., Tardif, Shatz, & Naigles, 1997). In addition, it has been shown that many of the constraints originally hypothesized to guide word learning are not used regularly by children until after the bulk of early word learning is accomplished (e.g., Merriman & Bowman, 1989). In response to these criticisms, recent formulations (reflecting, perhaps, the original intent; see Markman, 1989) of this approach to word learning have clarified that these domain-specific strategies are best viewed as default mechanisms from which word learning can proceed. Therefore, one should not expect to observe them across all situations or languages (e.g., Woodward & Markman, 1998).

The constraints approach to word learning has also been criticized from two primary theoretical perspectives. First, contextual theorists (e.g., Akhtar & Tomasello, 1998; Nelson, 1988) have argued that it is unnecessary to attribute internal domain-specific mechanisms to the child to resolve the word-learning paradox. Rather, it is argued, the social and pragmatic support for word learning provided by parents, other language users, and the communicative context is sufficient to resolve any inductive problem that exists. Furthermore, research has shown that even very young children are adept at detecting the types of subtle communicative cues that may disambiguate the intended meaning of a novel word used by a speaker (e.g., Akhtar, Carpenter, & Tomasello, 1996; Baldwin, 1993).

Second, it has recently been argued that the biases evident in children's word learning are a function of general learning and information-processing mechanisms rather than a function of a set of mechanisms specialized for the sole task of learning new words (Markson & Bloom, 1997; Samuelson & Smith, 1998). For example, Samuelson and Smith argued that children's preference to pay attention to novel objects and events can explain young children's performance during novel word-learning tasks just as well as either domain-specific strategies or children's sensitivity to unique communicative cues.

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Regardless of perspective, virtually all word-learning scholars agree that young children are impressive, efficient learners of words—that is, children engage in *fast mapping* of novel word meanings. First coined by Carey and Bartlett (1978), fast mapping refers to a child's ability to make a relatively complete guess as to the meaning of a novel word after minimal, or even a single, exposure to the novel word (see also Heibeck & Markman, 1987). For the current discussion it is important to note that fast mapping has usually been construed as a characteristic of word learning that sets it apart from other types of verbal and nonverbal learning.

A recent study by Markson and Bloom (1997) has challenged this seminal construct of children's early lexical development. Markson and Bloom reasoned that if fast mapping were a learning mechanism specific to word learning, then children should learn novel words (e.g., *koba*) for unfamiliar objects more readily than they should learn novel facts (e.g., "My uncle gave me this") or nonlinguistic (e.g., spatial) information about unfamiliar objects. Three- and 4-year-old children were taught a novel word, a novel fact, or a visually presented fact (a sticker was placed on one object) and were asked to recall this information immediately or after delays of up to 1 month. Markson and Bloom found that children recalled all types of information equally well when there was no delay. Though children's memory for the visually presented fact deteriorated quickly over time, both the novel word and the novel fact were recalled at above-chance levels even after a 1-month delay. Children's equivalent performance at remembering the novel word and novel fact led Markson and Bloom to interpret these results as "evidence against a dedicated system for word learning in children" (1997, p. 813).

It is our contention that a word-learning *system* must consist of more than simply memorizing novel names for real-world referents. Markson and Bloom's (1997) results were limited specifically to recognition memory for words and facts, and we believe that it is premature to make such a broad claim about the nature of a word-learning system based solely on these results. Indeed, inherent in the concept of a system is the notion of multiple, interacting components that perform multiple functions (e.g., the central nervous system, the immune system).¹ In this manner, a word-learning system must not only provide the child with a means by which to remember word-to-world associations, but at the very least it must also provide the child with a means by which to use a word appropriately in the future. Current theories of word learning acknowledge this necessity (see Bloom, 2000; many chapters in MacWhinney, 1999). With the notable exception of proper names, novel words for objects, actions, and attributes need to be appropriately extended to additional examples of those objects, actions, and attributes. This fundamental property of words has been called *extendibility*, the *taxonomic function*, or the *principle of categorical scope* (Golinkoff et al., 1994, Markman & Hutchinson, 1984; Woodward & Markman, 1998). For simplicity's sake, we use the term *extendibility* to refer to this property for the remainder of the article. However, extendibility does not apply uniformly to nonlabel information about entities. That is, novel count nouns are *necessarily* extendible to additional exemplars in a way that other types of novel verbal information (i.e., facts) are not. In this article we focus on this distinction between the necessary extendibility of object words and the variable extendibility of other facts about objects.

There is substantial empirical evidence that early word learners will extend a newly learned object name (Golinkoff et al., 1994; Waxman & Gelman, 1986) or action name (Behrend, 1995; Golinkoff, Hirsh-Pasek, Mervis, Frawley, & Parillo, 1995) to additional exemplars immediately after learning the new word. It has been implicitly assumed that extendibility, like fast mapping, is specific to novel word learning. Markson and Bloom's (1997) finding that children are equally adept at fast-mapping novel words and novel facts thus makes it crucially important to determine if children are also equally likely to extend these new pieces of information to additional exemplars. If children extend novel names and facts similarly, then the position that word learning is a function of general attentional and memory procedures would gain additional support. However, if children treat this information differently once it has been learned, then there would be evidence for an aspect of word learning that is unique when compared with other types of learning.

In an effort to address this question, we (Kleinknecht, Behrend, & Scofield, 1999) and Waxman and Booth (2000) recently expanded Markson and Bloom's (1997) paradigm by adding extension trials following a brief exposure to the novel information. Though there were some minor differences in procedures, both studies replicated the finding that 3- and 4-year-olds remembered a novel name and novel fact equally well. However, both studies also reported preliminary evidence that preschoolers extended novel words to more category exemplars than they extended novel facts. More specifically, in our earlier study (Kleinknecht et al., 1999), in which a free-choice task was used, we found that 3- and 4-year-olds were more likely to extend novel words than novel facts to additional members of a target category. Using both free-choice and forced-choice tasks, Waxman and Booth found that 4-year-olds nearly always extended a novel word to additional members of a target category and that they rarely extended the words to nontarget category members. In contrast, 4-year-olds extended facts at chance levels to target category members and to nontarget category members. Waxman and Booth thus concluded that the patterns of extensions found in their study demonstrated one manner in which a presumed word-learning principle was invoked differentially when children were learning words than when they were learning facts.

However, there are several limitations of these previous studies that demand further investigation. First, neither of these studies tested children younger than 3 years of age (in fact, Waxman & Booth, 2000, only tested 4-year-olds). In order to make a stronger claim that an extendibility principle for word learning exists when it would be of most use to the child (i.e., during early word learning), researchers must test children younger than those tested in these prior studies. Second, both studies tagged novel objects with either a novel name or a novel fact, and never with both. Objects are frequently tagged with both a name and a fact in a single sentence frame (e.g., "My uncle gave me this *koba*"), and children must be able to use the information conveyed in that frame to guide their future extensions of the name and the fact. Thus, an important test of children's systematic extensions of

¹ We are not claiming here that a word-learning system is equivalent to, or as biologically determined as, these other systems. We are simply using them as analogies.

novel words over novel facts would be to teach children both a name and a fact about an object and to assess extension patterns under this circumstance. Third, Waxman and Booth argued that linguistic form class is the primary cue to the correct pattern of extension for a novel word. However, they used an indefinite article (indicating the form class of a count noun) in their word condition (i.e., "This is a koba" and "Is this one a koba?") but not in the fact condition (e.g., "My uncle gave me this" and "Is this one that my uncle gave me?"). Thus, they may have inadvertently provided a cue to differential extension of words versus facts. Thus, in order to make stronger conclusions regarding the origins and robustness of children's extensions of novel words and novel facts, we needed to (a) test younger children, (b) compare extensions when a novel word and a novel fact are simultaneously presented in relation to a novel object, and (c) control for cues to extension as indicated by lexical form class. These issues provided the motivation for the current studies.

In Experiment 1 we addressed the first issue by teaching 2–4-year-olds a novel name for one object and an arbitrary fact for a second unfamiliar object. Following a brief assessment of children's memory for the name and the fact, children were shown new arrays of objects that included the original training object, additional exemplars of that object, and distractors. From these arrays, children were asked to select exemplars of the novel name or of the novel fact. In order to address the second and third issues, we developed a modified paradigm for Experiment 2. In this paradigm, we eliminated the memory check, placed the novel word and novel fact in a single sentence frame, and controlled cues to form class to allow for the simultaneous presentation of both a novel name and a novel fact about objects to 2–4-year-olds. We predicted that participants in all age groups in both experiments would be more likely to extend novel names than novel facts to additional exemplars.

Experiment 1

Method

Participants

Forty children between 28 and 62 months of age took part in this study. Children were recruited from preschools and day-care centers in the southern and western United States. Ten children (the 2-year-olds) were between 28 and 34 months of age, 15 children (the 3-year-olds) were between 37 and 48 months of age, and 15 children (the 4-year-olds) were between 51 and 59 months of age. Twenty-five girls and 17 boys were involved in the experiment. The children were primarily of European descent, although a substantial minority (18%) were of Asian descent, 1 child was Hispanic, and 1 child was African American. English was the first language of all children.

Materials

Training array. Children were shown an array of 11 novel objects that was used for the name and fact training and memory test components of the experiment. This array was modeled after the array used by Markson and Bloom (1997) and included a variety of unfamiliar household implements, hardware, and other miscellaneous items. All objects were approximately the same size and were easy for children to manipulate. Two of these objects (an L-shaped metal bracket and a T-shaped plastic plumbing fitting) were the target objects. One of these objects was designated the

koba, and one was designated "the thing that fell in the sink" in a counterbalanced manner. The other 9 objects were not labeled by the experimenter. Also included in this array were a ruler, a piece of string, and some pennies, which were used during name and fact teaching (see the *Procedure* section).

Test arrays. We constructed two test arrays of eight objects each. One was used for testing extension of the novel name, and the other for testing extension of the novel fact. Each test array comprised (a) the object from the training array used to teach the novel word or fact; (b) three new exemplars of the training object, differing from the original in size and color; and (c) four unique distractor objects that were not used in the training arrays.

Procedure

There were three phases to the procedure: name and fact training, memory trials, and extension trials. Each is described in detail.

Name and fact training. Children were tested in a private room at their preschool. Following the procedure used by Markson and Bloom (1997), we introduced the novel name and the novel fact to the children during a measuring game. All children were taught both the novel name and the novel fact in counterbalanced order. The training array was presented to the child, and the child was allowed to explore the array freely for 2 min. Following this exploration period, the experimenter picked up one of the training objects (the order was counterbalanced) and introduced it to the child by saying, "See this? This [is a koba/fell in the sink yesterday]." The experimenter then placed the object on the table and said, "Let's measure [the koba/what fell in the sink]. We can use [this string/these pennies/this ruler] to measure it." The experimenter and the child then measured the object, and the training concluded with the experimenter saying, "Let's put away [the koba/what fell in the sink yesterday]." The object was repositioned in the array, and the experimenter then began training the children on the second object in the same manner.

Memory test. Immediately following the training phase, we assessed children's memory for the novel name and novel fact. The experimenter removed the measuring implements from the array and asked the child to "Show me the koba" and "Show what fell in the sink yesterday" in counterbalanced order. Children responded by pointing to or picking up an object from the array, and these responses were recorded by the experimenter. Following both memory tests, the training array was removed from the table, and the experimenter told the child that she had some more things to show the child.

Extension trials. The order of the extension trials was counterbalanced. For the first extension trial, the experimenter chose the appropriate extension array and placed the objects on the table between the child and herself. The experimenter then asked the child, "Now when you look at these things, can you show me [the koba/the thing that fell in the sink yesterday]?" After children made their initial choice or choices, the experimenter prompted the child by asking, "Is there another [koba/one that fell in the sink] or not?" This prompt was used only once. Following the child's response to that prompt, the experimenter removed the first extension array from the table, replaced it with the second extension array, and proceeded to test for the child's extensions of the second piece of information in the same manner. Following completion of the second extension trial, children were given a sticker and thanked by the experimenter.

Results

Memory Trial Performance

As in previous research, children of all ages remembered the novel word (69%) and the novel fact (76%) at high rates that were above chance and that were not significantly different from each other. Twenty-six of the 40 (65%) participants passed *both* mem-

ory trials, including 60% of the 2-year-olds, 67% of the 3-year-olds, and 67% of the 4-year-olds. The age groups did not differ in the proportion of children who passed both memory tests, $\chi^2(2, N = 40) = .95, p > .05$. As in our earlier study (Kleinknecht et al., 1999), data from the participants who passed both memory tests were used for analysis of performance on the extension trials.

Extension Trial Performance

On the extension trials, children chose significantly more exemplars on the name trials ($M = 3.92, SD = 0.28$) than on the fact trials ($M = 2.72, SD = 1.37$). Table 1 shows that children in all age groups extended the novel word more frequently than the novel fact. Because of the lack of variability in 3- and 4-year-olds' extensions of the novel words, we analyzed the data with nonparametric tests of individual response patterns.

Examination of children's individual response patterns displayed more clearly the patterns of responding that contributed to the difference in the number of exemplars chosen. As is shown in Table 2, all but 2 of the participants who passed both memory trials extended the novel word to all appropriate exemplars during the word trials, and none restricted the word to a single exemplar. On the fact trials, however, 11 children extended the fact to all four exemplars, and 9 children restricted the fact to a single exemplar, which in all cases was the original training exemplar. These response patterns both differed from chance and differed from each other (Wilcoxon signed-ranks test, $p < .01$).

Discussion

The results from Experiment 1 strongly supported the hypothesis that children of all ages would extend novel words more frequently and more consistently than they would extend novel facts. The finding that 2-year-olds demonstrated this pattern to the same degree as older preschoolers strengthens the claim that this systematic extension of novel words is present during early word learning and that it is not simply a function of the older preschoolers' extensive additional experience with learning words and facts. If experience with words is necessary for this bias to develop, then the necessary experience occurs before children are 2 years of age.

There are two methodological concerns with Experiment 1. First, the use of the definite article *the* in the extension trials could have implied to the children that there was only one *koba* or one "thing that fell in the sink" in the extension arrays. Although the

Table 1
Mean Number and Standard Deviations of Objects Chosen on Word and Fact Extension Trials in Experiment 1 as a Function of Age

Trial type	Age			<i>M</i>
	2	3	4	
Word				
<i>M</i>	3.67	4.00	4.00	3.92
<i>SD</i>	0.52	0.00	0.00	0.28
Fact				
<i>M</i>	2.50	3.30	2.22	2.72
<i>SD</i>	1.22	1.25	1.48	1.37

Table 2

Distribution of the Number of Objects Chosen by Children Who Passed Both Memory Tests on Word Extension and Fact Extension Trials in Experiment 1

Trial type	Number of objects chosen			
	1	2	3	4
Word	0	0	2	24
Fact	9	2	4	11

Note. $p < .05$ by Wilcoxon signed-ranks test.

role of lexical form class in children's interpretation of novel words is well-known (e.g., Hall, Waxman, & Hurwitz, 1993; Waxman & Markow, 1998), the data from Experiment 1 show that children frequently chose more than one exemplar in the extension arrays. Nonetheless, it is possible that the use of the definite article suppressed the number of objects chosen in the experiment or otherwise confused some children. Second, one third of the participants did not pass both extension trials, and this had the undesirable effect of reducing the number of children whose extension choices could be meaningfully interpreted, as children cannot extend a word or fact that they have not yet learned.

With these methodological issues in mind, we modified our procedure so that the novel word and the novel fact were introduced in a single sentence frame in which the deictic *this* (which is uninformative regarding the presence of additional exemplars) was used. In addition, we eliminated the memory trial from the procedure in the following experiment by having the training object remain in view of the participants during the extension trials.

Experiment 2

Method

Participants

Seventy-seven children (42 boys and 35 girls) took part in this experiment ($M = 44$ months of age, $SD = 11.86$). There were twenty-eight 2-year-olds ($M = 31$ months, $SD = 2.70$), twenty-five 3-year-olds ($M = 41$ months, $SD = 3.53$), and twenty-four 4-year-olds ($M = 54$ months, $SD = 2.96$). Participants were recruited from preschools in the southern and midwestern United States. Most were from middle- and upper-middle-class families, and the majority (90%) were of European descent.

Materials

We created five sets of stimulus objects for this experiment. One array was used for the familiarization trial, and the other four arrays were used for the test trials. The familiarization array included 10 objects that were selected to meet the following three criteria: (a) Objects were familiar to the participants, (b) objects had names and/or properties that were familiar to the participants, and (c) objects were suitable for sorting along at least two different dimensions (e.g., color and shape). The familiarization array included three toy balls (green, blue, and multicolored), each made of a different substance, five green Styrofoam pieces (each a different shape and size, including the green ball), and three writing utensils (a pink marker, a green pen, and an ordinary pencil).

Each of the four test arrays included nine novel objects. Five of the novel objects (including a target object and four additional exemplars) in each test array belonged to the same category and differed on the dimensions of size and color. The four remaining distractor objects belonged to different categories than the target object and differed from the target object and each other in terms of their individual appearances. For example, one test set included five plastic, T-shaped plumbing joints and four additional distractor objects (e.g., a garlic press, a knife sharpener, a metal cylinder, and a suction cup). A new set of distractors and exemplars was used for each new trial set. The unfamiliar objects used in each trial set are listed in Table 3. In order to ensure that the positioning of the linguistic information did not influence participants' performance, we constructed sentences so that on two trials for each subject, the word appeared earlier in the sentence than the fact, whereas on the other two trials, the fact occurred earlier than the word. In addition, object sets were randomly paired with each word-fact combination. All objects used in this study were small enough to allow for easy manipulation but not so small as to fit in a 2-year-old's mouth.

Procedure

Each participant was asked to complete five trials: the familiarization trial and four experimental trials.

Familiarization trial. The purpose of this trial was to familiarize participants with the procedure and to indicate to the participants that it may be appropriate to choose either a single object or multiple objects in response to a question. During the familiarization trial, the familiarization array was presented to the participant. The experimenter labeled one of the objects with both a category name and a property (e.g., "This is a ball that is green."). The experimenter then placed the target object in the periphery of the remaining elements of the array (the target object remained in plain view of the child). Following the introduction to the target object, the participant was asked three times to select other objects from the array that matched the labeled object's category (e.g., "Are there any other balls here or not?") or property (e.g., "Are there any other things that are green or not?"). Children were given noncontingent approval for their choices and a sticker following this trial.

Test trials. For each test trial, the experimenter presented the nine objects of a test array to the participant. The experimenter indicated a target object from the array and introduced it with both an unfamiliar fact and an unfamiliar name (e.g., "My uncle gave me this koba"). The name and the fact were naturally introduced to the participant three times during a 1-min interaction similar to the one in Experiment 1. The target object was then positioned at the periphery of the array, although the target object remained in full view of the child. The participant was then asked the name extension question (e.g., "Are there any other kobas here or not?") and the fact extension question (e.g., "Are there any other things my uncle gave me here or not?") in a counterbalanced order. Children typically responded by pointing to or picking up their response choices. If any objects were moved from the array during the first extension trial for a given stimulus set, the experimenter returned them to the array before the second extension

question was asked about that set. At the completion of each test trial, participants were given a sticker, and the remaining test trials proceeded in the same manner. The order of stimulus presentation was randomized across trials, as was the pairing of the novel name and fact to test arrays.

Results

Each participant who completed the familiarization trial ($N = 68$, age range = 27–70 months) also completed the four word extension trials and the four fact extension trials. The following analyses thus included twenty-two 2-year-olds, twenty-three 3-year-olds, and twenty-three 4-year-olds. The primary dependent measures were the number of exemplars chosen during the novel word extension trials and the number of exemplars chosen during the novel fact extension trials. The mean number of extensions for both the word and the fact trials was calculated by obtaining a sum of the total number of exemplars chosen from the array during each of the trials and dividing that total by 4. Because there were four additional exemplars available for selection during each trial, the mean number of possible extensions for both the word and the fact ranged from 0 to 4 for each child. Again, few ($M = 0.41$) distractors were chosen, and these data are not analyzed any further.

A 3 (age group) \times 2 (extension type: word vs. fact) analysis of variance with extension type treated as a within-subjects factor was conducted on the mean number of exemplars chosen. The means relating to this analysis are shown in Table 4. This analysis revealed a main effect of extension type, $F(1, 65) = 94.30$, $p < .001$, but no effect for age group and no interaction between the two factors. As predicted, children across all ages were more likely to extend the new word to additional exemplars ($M = 3.32$, $SD = 0.96$) than they were to extend the new fact to additional exemplars ($M = 1.69$, $SD = 1.34$).² These results are consistent with those of previous studies in which children have demonstrated a propensity to extend novel words more frequently than novel facts (Kleinknecht et al., 1999; Waxman & Booth, 2000).

Analysis of children's individual response patterns corroborated this initial analysis. First, we simply asked whether each child made more word extensions ($N = 52$) than fact extensions or more fact extensions than word extensions ($N = 3$). The remaining 13 participants made an equal number of word and fact extensions. This difference was highly significant by a sign test ($p < .01$). Second, we compared the distributions of the precise number of word extensions and fact extensions made by participants across all four trials. As is clearly demonstrated in Table 5, the distributions for the word extensions and fact extensions differed significantly from each other (Wilcoxon signed-ranks test, $p < .001$). Most important, children extended the novel word to all (and only) appropriate exemplars on 71% of all trials and restricted the novel word to just the training exemplar (i.e., chose no exemplars on the extension trial) on just 7% of the trials. On the fact extensions trials, children extended the fact to all exemplars on 32% of the trials and restricted the word to just the training exemplar on 41% of the trials.

Table 3

Novel Phrases, Including Novel Words and Novel Facts, and Novel Objects Used in Experiment 2

Novel phrase	Novel target object
My uncle gave me this koba.	Plastic T joints
My cat stepped on this agnew.	Metal shelving brackets
This jeter was found in the park.	Inverted plastic funnels
This nixon fell in the sink.	Allen wrenches

Note. Target objects were randomly assigned to the novel phrases across participants.

² Paired sample t tests were conducted on each item. As participants made significantly more word extensions than fact extensions for all four items (all $ps < .01$), no further item analyses were conducted.

Table 4
Mean Number and Standard Deviations of Objects Chosen on Word and Fact Extension Trials in Experiment 2 as a Function of Age

Trial type	Age			<i>M</i>
	2	3	4	
Word				
<i>M</i>	2.82	3.48	3.64	3.32
<i>SD</i>	1.11	0.95	0.60	0.96
Fact				
<i>M</i>	1.69	1.67	1.73	1.69
<i>SD</i>	1.10	1.16	1.71	1.34

General Discussion

The current findings replicated and extended our earlier findings (Kleinknecht et al., 1999) and those of Markson and Bloom (1997) and Waxman and Booth (2000). Using very similar procedures, we replicated the finding that 3–4-year-old children learned a novel word and a novel fact equally well and showed that the same was true for 2-year-olds. However, the current findings demonstrate that the paths of word learning and fact learning diverge after the point at which a child has successfully remembered a novel word or fact. The results of both experiments reported here showed that young children extended a novel word to more category exemplars than they extended a novel fact. These findings were robust across the varying procedures, materials, novel facts, and novel words used in the current studies.

There are three characteristics that distinguish the results of the current studies from prior research showing similar results (Kleinknecht et al., 1999; Waxman & Booth, 2000). First, the current findings demonstrate differential extension of words and facts in 2½-year-old children at rates that were not statistically different from the rates of older children. Demonstrating this capacity a year earlier than it has been demonstrated previously is important because, regardless of theoretical bias, it informs our theories of word learning as to when we can attribute to the child the ability to differentially extend words and facts.

Second, we found differential extension of words and facts in Experiment 2 in a task in which children were required to extend a word and a fact that were taught about the same object in a single sentence frame. By demonstrating that the same object can have simultaneously different extensions, we were able to clarify that it is the type of information that is guiding extensions and not some other idiosyncratic characteristic of the objects or of the procedure in Experiment 1. Furthermore, the procedure in Experiment 2 did not include a memory trial, as it was clear that children were equally able to remember the novel word and the novel fact. This methodological change not only simplified the task for the youngest children but also allowed us to more clearly differentiate the process of initially remembering a novel word from the extension of the novel word. As no recognition memory was required in this task (the object stayed in sight throughout the trial), it appears that the differential extensions of novel words and novel facts are not simply dependent on the general recognition memory processes demonstrated by Markson and Bloom (1997).

Third, the procedure in Experiment 2 also controlled for linguistic form class by introducing both the novel word and the novel fact with the term *this*. As the term *this* is ambiguous with regard to the lexical form class of the term it precedes, the results from Experiment 2 demonstrate that a cue to lexical form class need not be present at the time of learning to guide extensions. We are not arguing that form class is not a cue to future extensions; it clearly is an extremely important one (see Bloom, 2000; Hall et al., 1993; Waxman & Booth, 2000). Rather, it appears to be the case that lexical form class is not the only cue that young children can use to differentiate the appropriate extension of a novel word and a novel fact.

Thus, there is now converging evidence that word learning and fact learning differ with regard to the important property of extendibility. Furthermore, anecdotal evidence from the experimental sessions helps to reinforce the conclusion that young children systematically extended the novel words but were more variable and less systematic in their extensions of the novel facts. Many children appealed to the experimenters for help or hints on the fact extension trials, whereas many children frequently chose all four exemplars on the word trials before the experimenters had an opportunity to ask them to do so. These reports of the qualitative behavior of the children during the experimental session serve to reinforce the conclusion that children as young as 2½ years of age extend a novel word for a novel object systematically and differently from how they extend a novel fact about a novel object.

It is important at this point to note that Markson and Bloom (1997) did not intend their initial study to address the issue of extensions of words versus facts. In fact, Bloom and Markson (2000) reported that they were not surprised by Waxman and Booth's (2000) results (and, we would assume, they would not be surprised by our results either). However, by concluding that their original results were evidence against a system for word learning, Markson and Bloom opened the door for researchers to search for the limits or the boundary conditions of their landmark findings. The current studies, as well as those of Waxman and Booth, are examples of this type of research. Our theories and models of word learning must not only account for initial mappings of meanings but also for the manner in which children use these mappings when confronted with additional novel items in their environment. On this matter, it seems clear that word learning and fact learning are not identical processes.

Despite these clear findings, the question still remains as to what we should attribute children's differential performance when extending novel words and novel facts. Is this pattern of results predictable from general cognitive processes, or are there processes unique or "dedicated" to extending words as opposed to

Table 5
Percentage of Children Who Extended the Novel Word and Novel Fact to Additional Exemplars in Experiment 2

Trial type	Number of exemplars				
	0	1	2	3	4
Word	7	8	7	7	71
Fact	41	17	7	3	32

Note. $p < .01$ by Wilcoxon signed-ranks test.

facts? In addition, we also need to ask what role context plays in the development of this differential behavior.

Though the current results are not definitive with regard to this matter (see Bloom & Markson, 2000), we interpret the results in the following manner. We believe that there are shared components and unique components in word and fact learning, as is the case with many types of learning. Whereas the same set of general attentional and cognitive processes may be used during the initial learning of words and facts, there may be a divergence of processes when children decide how to use these novel words. That is, once a word is recognized as a novel count noun, children as young as 2 years of age process the novel word as referring to a class of entities and, hence, extend it freely to additional exemplars.

With facts, however, children may need to access and rely more on their general world knowledge to determine if a fact is extendible to additional exemplars. There is a large literature on the inductive inference process in both adults (e.g., Holland, Holyoak, Nisbett, & Thagard, 1985; Nisbett, Krantz, Jepson, & Kunda, 1983) and children (e.g., Gelman, Collman, & Maccoby, 1986; Wilcox, Behrend, & Kendall, 1997) that demonstrates that adults and children do not extend facts equivalently across category members. However, in many (if not most) fact-learning contexts, real-world knowledge must be brought to bear on children's inductive extensions of nonlabel information about unfamiliar objects. Thus, at least as far as extension of novel information goes, it certainly remains possible that children are using a unique or dedicated set of processes for novel names when compared with novel facts.

The origin of this important difference between the extensions of words and facts remains in question. One possibility is that this difference fits the model of a constraint or lexical principle that emerges early in word learning as a default-processing strategy (e.g., Golinkoff et al., 1994). A second possibility is that different, though unique, sets of general-information-processing capacities are brought to bear in early childhood when children begin to differentially extend novel words and novel facts. For this account to be convincing, however, a complete explanation along these lines would have to demonstrate under what conditions such processing sets are activated (see Smith, 1999, for what such an explanation might look like). Third, it is possible that the patterns of extensions demonstrated in the current article are a function of the child's experience in the communicative context and general social understanding (see Bloom, 2000). That is, children learn through interaction with other language users that words are uniformly extendible and that facts are not uniformly extendible. For example, it may be possible that children are exposed to more examples when learning novel words or more exceptions when learning novel facts, and this pattern of input contributes to children's extension patterns. In recent work related to this possibility, Diesendruck and Markson (2001) have shown that children's performance in a mutual exclusivity task is affected by changes in the social context. Continued research along these lines that includes children 2 years of age and younger will be crucial to determining which of these explanations best fit the empirical record.

Children are smart word learners who need minimal exposure to a new word in order to both remember and appropriately extend that word. A true word-learning system must provide the means to accomplish both of these goals. What is at issue is how best to

describe the processes through which this smart learning occurs. However it occurs, we concur with Waxman and Booth's (2000) contention that there are some principles involved in the learning of words that are not involved in the learning of facts. We would add to this claim that these principles are available to children as young as 2 years of age. Charting the origins and developmental course of such principles should be a common goal of the field.

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