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ABSTRACT

To examine relationships between children's exposure to and use of new or rare words during preschool years and their later performance on vocabulary-related measures, this study explored frequencies of rare word use in different conversational settings. The study also tracked the use of rare words by mothers and children and related those results to vocabulary test scores and the ability to give definitions of a set of common words when the children were 5 years old. Children eligible for Head Start programs were recruited for the study. Eighty-four low-income families were visited at home once each year when the children were 3 and 4 years old. During these visits each mother performed a variety of tasks with her child. These tasks were reading two books to her child (one provided by the researcher and one familiar to the child); eliciting a report from the child of an interesting recent event; and playing with toys provided by the researcher. All events were tape recorded. Each mother was also asked to record a mealtime conversation. Analysis of the transcribed recordings indicated that the largest proportion of rare words were used during the reading of the book familiar to the child and during everyday conversation at mealtimes. However, no correlation was found between the use of rare words in book readings and later vocabulary measures. (MM)

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# Arboretum, Bureaucratic, and Carbohydrates: Preschoolers' Exposure to Rare Vocabulary at Home

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Carey (1978) has estimated that children learn an average of nine new words a day between the ages of eighteen months and six years as their vocabulary expands from 0 to 14,000 words. Nagy and Herman (1987) estimate that this rate of lexical growth continues on through the high school years, with an average annual rate of growth of 3000 words, or 8 words per day. While estimating vocabulary size is an imprecise enterprise, even the most conservative estimates suggest that vocabulary acquisition is an incredibly rapid process.

How do children acquire such impressive vocabularies? During the preschool years, children are not generally given direct instruction in word meaning and use, but acquire new words through incidental exposure in everyday situations. In fact, a single exposure to a new word in naturalistic conversations has been shown to be a sufficient means for even a very young child to acquire some understanding of this new term (Carey, 1978, 1982; Carey & Bartlett, 1978; Dickinson, 1984; Dollaghan, 1985). In one hearing of the word, the child is able to map an initial but incomplete semantic representation onto the spoken word, a process Carey has called fast mapping. Subsequent exposure to the word will add to this representation, allowing for a more complete mapping of the meaning onto the word (see Rice, 1990 for a proposed model of this process). Apparently, this mapping process (or some version of it) from words in context - either spoken or written - continues through the school years as children acquire and hone the ability to read and write. Even in high school children receive direct instruction on only a few hundred of the 3000 new words they learn each year.

This ability of young children to benefit from exposure to new words in context raises the question of whether or not different kinds of conversational contexts may provide different levels of exposure. In this paper, we address two questions: (1) do some types of conversation provide more exposure to new vocabulary than others?, and (2) what is the relationship between exposure to and use of new or rare words in different situations during the preschool years and later vocabulary related measures?

In order to address these questions, we undertook a study of vocabulary found in a variety of conversations that took place within families of preschool-aged children, conversations which had been previously recorded as part of a larger study. In this paper, we examine the set of words used in these conversations and identify what we call rare words from these lists. We explore the frequencies of rare words in different conversational settings: at family mealtimes, during book readings, while mothers and children play with toys, and during a report of a recent past event told

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by mothers and children<sup>1</sup>. After establishing these frequencies, we then return to the individual transcripts to track the use of the rare words by mothers and children and relate those results to vocabulary test scores and the ability to give definitions of a set of common words when the children were five years old.

### The Study

The spoken words used for this study are drawn from transcripts of conversations collected from 82 families (with 84 target children - two families had twins, both of whom are in the study). These families are all participants in the Home-School Study of Language and Literacy Development, a longitudinal study of the social precursors to language development in low-income, English-speaking families. This project, which has been funded by the Ford Foundation, the Spencer Foundation, and the Department of Health and Human Services, has been collecting data annually since 1988 both in the children's homes and in their classrooms. The co-principal investigators of the project are Catherine E. Snow of the Harvard Graduate School of Education and David K. Dickinson of the Education Department, Clark University (Snow, 1991; Snow, Dickinson, & Tabors, 1989).

The children in the study come from a range of cultural, racial, and economic backgrounds. Fifty-five of the children (65.5 percent) are white, twenty-three (27.4 percent) are African-American, and six (7.1 percent) are of Hispanic heritage. There are 41 males and 43 females. Although the families in the study are considered to be low-income on the basis of the child's eligibility for Head Start or other similar preschool programs, they, in fact, represent a wide range of social and economic situations. About half of the mothers (48.8 percent) have reported that they graduated from high school and have not pursued further education. A quarter of the mothers (25.0 percent) have reported that they did not finish high school, while the remaining quarter (26.2 percent) have reported that they have received some post-high school education, usually some vocational training. Half of the families reported welfare as their primary source of income.

Family configurations also vary widely among the families. A total of 28 families consisted of one parent (mother) and her child or children at the beginning of the study. Thirty-nine families reported two adults, usually the father, step-father, or another adult male in the household. Eleven other families reported the presence of more than two adults living in the home. For example, two families consisted of the mother, the target child, and the mother's parents.

#### Data collection

As part of the study, the families were visited at home when the children were three years old and again when they were four. During these visits each mother was asked to do a variety of tasks with her child. First, she was asked to read two books to her child, The Very Hungry Caterpillar, by Eric Carle, and the child's favorite book. (If the child did not have a favorite, the mother chose one, and if finding an appropriate book was a problem, the home visitor provided one.) Next, she was asked to elicit a report from the child of some interesting or exciting event which had happened recently. And finally, the mother and child were asked to play with a set of toys that the home visitors provided. All of the conversations which occurred during these tasks were tape recorded. At the end of the visit, the mothers were given a blank tape and recorder and asked to record a family mealtime conversation. The recorders and tapes were later retrieved by the home visitors.

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<sup>1</sup> For the purposes of this paper, we will be addressing conversational contexts exclusively, although it is understood that there are other possible contexts as well, such as video (Rice, 1990) or written texts.

### Developing the word lists

All of the conversations which were recorded during the home visits were transcribed into computer files according to the Codes for the Human Analysis of Transcripts (CHAT) conventions for analysis by the Child Language Analysis (CLAN) software available through the Child Language Data Exchange System (CHILDES) (MacWhinney & Snow, 1990). Using a CLAN program called *FREQ* (for frequency), word lists were generated for each of the conversational contexts. The results of this analysis are displayed in Table 1.

As can be seen in Table 1, a total of 153 visits were made to the families in the two years resulting in 150 elicited reports, 151 of each of the book readings, 153 toy plays, but only 107 mealtimes. The varying numbers are a result of the fact that young children do not always cooperate with the best-laid plans of researchers, and that collecting the mealtimes from the families proved a difficult task for the home visitors. Each of the tasks resulted in a different quantity of talk, indicated by the number of tokens (total number of words) used. The elicited report, for instance, was a difficult task for the three- and four-year-olds as they had to first remember and then structure their talk about a past event with their mothers' help; this task resulted in the least amount of talk. The Very Hungry Caterpillar is a relatively short book and therefore generated less talk than the variety of books which were chosen as a second book to read<sup>2</sup>. The toy play sessions generated the most words among the tasks which were done during the home visits. During toy play, mothers and children chatted while they manipulated the toys, often discussing fantasy world scenarios as they played. Unlike the book readings and elicited reports, toy play lasted as long as fifteen minutes, and it was up to the home visitors to terminate the task. And, finally, the family mealtimes generated the highest number of tokens (despite the lower number of transcripts), being the most naturalistic and least time-constrained of the tasks, averaging about 20 minutes in length, and involving all of the members of the family, not just the mother-child dyad. The total corpus for all of the speakers for all of the tasks combined from both visits amounted to 527,482 spoken words.

Table 1  
Types and Tokens of Words Found in Transcripts By Conversational  
Context (Age-3 and Age-4 Visits Combined)

Conversational Context	Number of Transcripts	Tokens	Types
Elicited Reports	150	39,412	2299
Book Readings (VHC)	151	72,798	1433
Book Readings (Choice)	151	107,433	5068
Toy Play	153	152,914	3349
Mealtimes	107	154,925	4803
Overall	712	527,482	8456

Table 1 also indicates that the tasks generated different numbers of types (the total number of different words). For instance, although the elicited reports generated a little more than half as many tokens as the reading of The Very Hungry Caterpillar, there were half again as many types in the elicited reports. This is most likely explained by the fact that both the text and the discussions

<sup>2</sup> For the purposes of this analysis the text of the books was included as spoken words in the corpus.

concerning the text of The Very Hungry Caterpillar were highly redundant, whereas the elicited reports covered many topics ranging from a trip to an amusement park to what happened at school that day, generating, therefore, a more diverse set of words. In the same way, although the number of tokens for toy play and mealtimes are similar, toy play, with its more constrained set of circumstances, i.e., a single set of toys, generated far fewer types than mealtimes, which involved wide-ranging conversations among family members. Finally, while the number for the overall tokens represents all of the tokens added together from the different conversational contexts, the figure for overall types is smaller than the total of all types in the separate categories, since many of the types are found in multiple settings.

Having generated word lists for each of the conversational contexts, it was necessary to develop a procedure which would help us define a certain number of the words represented in each corpus as "rare vocabulary," i.e. words which would be unusual for a preschooler to have been exposed to previously. Our decision was to use a procedure which would extract the most common words from the corpus, leaving a list of uncommon words, and then follow a further set of procedures to remove uncommon words which were, in fact, merely oddities, leaving, at last, a residual list of rare words.

We used as our list of common words the list developed by Jeanne Chall and Edgar Dale of words known by 4th graders (in press). In its original form this list contained 3,000 uninflected words. After adding inflections and removing proper nouns, we arrived at a list of 7,881 words. Each of the original word lists was again submitted to the FREQ program, this time removing any words found on the common words list. The resulting lists contained two types of uncommon words: rare words (like "arboretum," "bureaucratic," and "carbohydrates") and oddities (like "cowabunga," "brang," and "tummy"). Each of the uncommon word lists was then edited to remove the following forms: all proper nouns; exclamations, conversational markers, and expletives; forms of address; child reduced forms; slang, dialectical forms, and incorrect forms; and child culture terms. These final lists were considered to contain words which would be unusual or rare in the lexicon of a three- or four-year-old.

### Correlational analysis

Once the lists were generated, we obtained each mother and child's frequency for use of rare words in each of the conversational contexts. These frequencies were then used in a correlational analysis with two vocabulary measures which were administered to the children when they were five years old. The first of these was the Peabody Picture Vocabulary Test (PPVT-R) (Dunn & Dunn, 1981), a common measure of a child's receptive vocabulary. The child's raw score on the PPVT was the outcome measure on this task.

The second measure was one designed by Snow (1990) to assess a child's ability to give a formal definition. In this task the child was asked to give definitions of 14 nouns. These definitions were scored on a variety of dimensions including whether or not they were formal definitions, which require a superordinate category with a relative clause (e.g., "a thief is a person who steals"). The definitions score is an indicator of the child's knowledge of a word meaning and his ability to express that meaning to someone else.

## Results

We report the results in three sections: 1) exposure to rare words across contexts; 2) use of rare words by mothers and children; and 3) associations between rare word use and other vocabulary measures.

### Exposure to rare words across situations

In answer to the first of our two questions, we found that the different conversational contexts did, indeed, display different levels of exposure to rare words. Table 2 contains the

frequencies of types of words found in each list (the original or all words list, the uncommon words list and the rare words list) and the percent of rare words (the number of rare words divided by the total words in the original list) for each conversational context.

Table 2  
Total Types of All, Uncommon, and Rare Words and Percent of Rare Words By  
Conversational Context

Conversational Context	All Words	Uncommon Words	Rare Words	Percent of Rare Words
Book Readings (VHC)	1433	271	143	10.0%
Elicited Reports	2299	710	269	11.7%
Toy Play	3349	1113	555	16.6%
Mealtimes	4803	1976	1086	22.6%
Book Readings (Choice)	5068	1819	1309	25.8%
Overall	8456	4232	2601	30.8%

The variations in the proportion of rare words as shown in Table 2 indicates that the different conversational contexts provide varying levels of new or rare vocabulary input. At the high end, the reading of the book of choice provides the largest proportion of rare words, while reading The Very Hungry Caterpillar represents the lowest. As mentioned previously, both the text and the discussions of the text of The Very Hungry Caterpillar were highly redundant; this fact influences not only the number of types, but also the relatively low proportion of rare words. The book of choice, on the other hand, represents a wide range of material, during which many vocabulary items are introduced which fall into our rare category. (Of course, each child was exposed to only one book, not all of the different ones.)

The everyday conversation found in mealtimes also provided a large amount of vocabulary input. This is where the most talk took place among all the conversations we collected. The sheer volume of talk resulted in the possibility of exposure to many new words. But it appears that it isn't simply that more talk means more rare words. Explanations and narratives within mealtime conversations, which were coded and processed separately, accounted for 673 of the 1086 rare words (62 percent) found in mealtimes. It would appear that these specialized types of discourse provide a particularly important source of vocabulary input for the children.

As Table 2 demonstrates, toy play generated a lower proportion of rare words than did mealtimes and reading the book of choice. In toy play situations, the conversation necessarily converged around the particular set of toys which had been provided by the home visitors. However, the new words were not limited to the names of items in the toy bag; the fantasy play that mothers and children created around these toys allowed them to broaden the vocabulary they used.

Elicited reports presented a relatively limited source of new words for children. In the elicited reports, the task itself was so challenging for the young children, that mothers might well have chosen to reduce the vocabulary load during this task.

Finally, as in Table 1, the overall number of types for the all lists is smaller than the sum of the individual all lists, due to the overlap in words across lists. The fact that the proportion of rare words in the overall corpus is 30.8 percent indicates that common words are overlapping to a high degree across the conversational contexts, but that the rare words are overlapping to a lesser extent. In fact, 77 percent of the rare words appear in only one of the contexts.

### Use of rare words by mothers and children

In order to begin to answer the second of our questions concerning the relationship between exposure to rare words and later vocabulary measures, we examined the use of rare words by individual target children and their mothers during the three-year-old and four-year-old visits. We consider the use of rare words by the mother as an measure of the child's exposure to new words. A child's use of rare words could have been a repetition or discussion of a word used by the mother (or book), or it could have been an established word in the child's vocabulary. In the former case, we see an instance of the child's uptake of a new word; in the latter, we see the child's present vocabulary knowledge. Our analysis does not allow us to distinguish these cases. The results are displayed in Table 3.

Table 3  
Means and Ranges of Frequencies of Types of Rare Words Used by Children and Mothers at Age-3 and Age-4 Visits by Conversational Context

Conversational Context	Child		Mother	
	Age 3 Visit	Age 4 Visit	Age 3 Visit	Age 4 Visit
Elicited Reports	0.87 (0-8)	0.89 (0-6)	1.70 (0-7)	1.63 (0-15)
Toy Play	1.36 (0-9)	2.33 (0-8)	4.89 (0-21)	5.44 (0-23)
Book Readings (VHC)	1.00 (0-5)	1.19 (0-6)	4.66 (0-13)	4.17 (0-10)
Book Readings (Choice)	0.68 (0-4)	1.01 (0-10)	11.93 (0-67)	13.83 (0-68)
Mealtimes (All)	3.06 (0-18)	4.28 (0-17)	7.69 (0-44)	9.78 (0-35)
Explanatory Talk	0.64 (0-8)	1.07 (0-6)	2.63 (0-21)	3.27 (0-18)
Narrative Talk	0.70 (0-13)	0.63 (0-6)	1.84 (0-15)	1.84 (0-16)

First, not surprisingly, the means are far smaller and the ranges far less extensive for the children than for the mothers. Unlike many results related to conversation in which mothers and children mirror each others' usage, these results point to the wide differential in vocabulary use between adults and young children. Young children simply don't know as many words. Second, there are no obvious developmental differences in the two visits; in fact, there is considerable consistency across years within conversational contexts. Third, as has been identified before, the use of rare words is context specific; for instance, the lowest for both the mothers and children comes in the elicited reports and in the narratives at mealtimes (strikingly similar circumstances), while the highest, for the mothers, comes in the book of choice in which the text is clearly providing much of the new vocabulary input. Finally, the means and ranges for both children and

mothers demonstrate that the use of rare words is not normally distributed in this population, but is severely skewed to the left, meaning that only a few of the mothers and children account for the upper range of rare word use.

Associations between rare word use and later vocabulary measures

The correlational analysis between mother's and child's individual rare word use and the vocabulary measures administered individually when the children were five years old shows that there are relationships between exposure to and use of rare words in different conversational contexts and later achievement on vocabulary measures. Table 4 presents the results for mothers' and children's rare word use and the outcomes on the PPVT; Table 5 presents the results for the mothers' and children's rare word use and the outcomes on the definitions task.

Table 4  
Correlations between Children's and Mothers' Rare Word Use at Age-3 and Age-4 Visits and Children's Scores on the PPVT at Age 5 (Pearson  $r$ ,  $p < .01$ )

Conversational Context	Child		Mother	
	Age 3 Visit	Age 4 Visit	Age 3 Visit	Age 4 Visit
Elicited Reports	.409		.496	
Toy Play	.386	.507	.363	
Mealtimes		.428		
Explanatory Talk	.398			
Narrative Talk				



Table 5  
Correlations between Children's and Mothers' Rare Word Use at Age-3 and Age-4 Visits and Children's Scores on the Definitions Task at Age 5 (Pearson  $r$ ,  $p < .01$ )

Conversational Context	Child		Mother	
	Age 3 Visit	Age 4 Visit	Age 3 Visit	Age 4 Visit
Elicited Reports		.449		.353
Toy Play		.323		.343
Mealtimes				
Explanatory Talk	.386			
Narrative Talk				.389

From these tables, we see that the use of rare words by mothers and children in toy play and elicited reports is positively associated with both vocabulary measures at age 5. Specifically, children's and mothers' use of rare words at age 3 are correlated with the PPVT, while their frequencies of rare words at age 4 are correlated with the definitions score for both contexts. Children's rare word use at age 4 in toy play is correlated with the PPVT scores as well.

The child's use of rare words within mealtime explanatory talk at age 3 was also a predictor of both vocabulary measures, while children's use of rare words in general mealtime talk at age 4 correlates with the PPVT, and mothers' use of rare words in mealtime narrative talk at age four correlates with the definitions outcomes.

The most outstanding non-finding in these tables is that there were no correlations between the use of rare words in either book reading situation and the vocabulary measures. An explanation of why this may be the case follows in the discussion section.

### Discussion

What have we found out about the effects of exposure of young children to new vocabulary in different conversational contexts? First, we have found that not only do different conversational contexts generate different proportions of rare words, they also generate different rare words as well, i.e., 77 percent of the rare words were found in only one context.

We also have found that different conversational contexts may be more supportive of new vocabulary acquisition than others. For example, in both the elicited reports and the mealtime narratives, far fewer rare words were used by both mothers and children than in the other contexts, perhaps due to the other demands of the task. The use of rare words in these two narrative contexts, however, was still predictive of later vocabulary measures. In toy play, both mothers and children displayed higher means and frequencies, indicating that this may be a highly supportive context for the use and uptake of new vocabulary; this use was also related to later vocabulary measures. In overall mealtime conversation, the means and frequencies for mothers' and children's use was even higher, although many of these words might well be related to the task at hand, i.e., the consumption of broccoli, spaghetti, and cantaloupe. The more potent source of new word learning within mealtimes seems to be during explanatory talk, particularly at age 3,

when children, in some explanations, were even asking for definitions of words ("what does 'your highness' mean?").

It is often assumed that reading books to children will help them learn new words. We have found that they are indeed exposed to new words (depending on the book), but it is not clear that young children learn as much from book reading as they do from other situations. None of the measures of rare vocabulary use in book readings showed any relationship to the vocabulary measures. There are a couple of possible explanations for this finding. First, in reading books, the vocabulary is dictated more by the book and less by the speakers' abilities than in the other conversational contexts. Perhaps the rare words used need to be ones that the mother or child already know in order for them to be used in helpful ways in the conversation during book reading. Second, it may be that the use of new words in bookreading has too little context available for a child of three or four to begin the mapping of meaning onto the word, and more discussion around the word is needed. In either case, this finding demands a closer analysis of bookreading as a word-learning situation. By examining word lists generated without the text of the book (which we included in this study), we would be able to tease out some of these issues. If discussion of a new word occurs, rather than just hearing the word read in its book context, will the child be more likely to expand her vocabulary? And does more lengthy, in-depth discussion around a word help more than incidental exposure to the word in discussion about the book?

Different conversational contexts afford different opportunities to learn new words. Because each context varies in the kinds of words and the ways words are used, it appears that exposure to vocabulary-rich talk in many settings will allow the greatest opportunity for growth. Each setting will teach not only its own vocabulary, but its ways of using those words, according to the speakers' purposes for talk within that setting.

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