

*IN VIVO LANGUAGE INTERVENTION: UNANTICIPATED
GENERAL EFFECTS*

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After observing the lack of generalization of language trained in highly structured training sessions using established behavior modification techniques, "incidental teaching" procedures were developed to change the use of specified language behaviors in the natural environment. This paper reports an analysis of the general changes in the language, other than that specifically targeted by the incidental teaching procedures, used by disadvantaged preschool children. The daily language samples of disadvantaged children involved in a previously reported experiment to increase compound sentence usage were reexamined and compared to comparable records of other disadvantaged children and of middle-class children of college parents in order to assess possible general effects of the intervention program. Whereas the language that both groups of comparison children used changed little across the preschool year, the amount of talking by the children in the experimental program increased markedly. Their use of more elaborate vocabulary and more elaborate sentences also increased in direct proportion to the increases in overall language use, such that both language use and language elaboration in the experimental group of children changed from a pattern similar to the comparison group of disadvantaged children to a pattern similar to the comparison group of middle-class children. It is argued that some general features of the incidental teaching procedure—differentially attending to child overtures and responding relative to the child's selected topic (reinforcer)—contributed to the increase in overall language use beyond the specific language behavior targeted, and that this increase in the probability of children's talking itself resulted in the substantial increases in elaboration seen in the children's spontaneous language. Because, at least in children with fairly well-developed language repertoires, language use is contextually controlled, talking more involves talking in more varied and complex contexts, which inevitably produces the use of more elaborate language.

DESCRIPTORS: language, incidental teaching, disadvantaged children, preschool children

The focus of applied behavior analysis on socially significant problems (Baer, Wolf, & Risley, 1968) led, in the area of language research, to an emphasis on remediating and/or

establishing language behavior. Some of the earliest studies reported the use of reinforcement principles to extinguish psychotic talk (Ayllon & Michael, 1959) and to reinstate verbal behavior in adults (Isaacs, Thomas, & Goldiamond, 1960; Sherman, 1963). However, the major focus of operant language research was to establish appropriate language repertoires in children who had previously had little or no functional language (Kerr, Meyerson, & Michael, 1965; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Risley & Wolf, 1967; Wolf, Risley, & Mees, 1964). From this research an operant training technology developed, a technology that virtually revolutionized the remedial training of

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language (see Lovaas, 1977; Risley, Hart, & Doke, 1971; Schiefelbusch, 1978; Sloane & MacAulay, 1968). Central to the effectiveness of this language-training technology is the creation of conditions of maximum stimulus control. Language trainers arrange an environment from which all distractions have been removed; they present carefully selected and programmed stimulus materials; they differentially reinforce successive approximations while extinguishing or punishing errors and nontask-related behaviors; and they use powerful reinforcers such as food.

This proven technology was initially applied to the remediation of the language of disadvantaged children in the language research undertaken at the Turner House Preschool. Within a preschool setting we created conditions of close stimulus control. Imitation was trained in one-to-one settings (Risley & Reynolds, 1970) and various aspects of language were trained in small-group settings (Hart, 1975; Risley, Reynolds, & Hart, 1970). The operant training technology was as effective when applied in a preschool setting as it had been shown to be in institutional settings. But in the preschool, as in the institution, generalization was a problem. The language trained under close stimulus control failed to generalize to any marked extent into spontaneous language use in uncontrolled situations (Guess, Sailor, & Baer, 1974; Hart & Risley, 1968; Menyuk, 1975). Therefore we set out to create the conditions for the "generalization of language behaviors from the controlled training setting in which (we know) they can be taught, to the child's 'natural' environment" (Guess, Sailor, & Baer, 1974, p. 541). We rearranged the preschool environment so that the language we had trained in controlled settings was not only functional but necessary to the children in gaining access to the reinforcers (attention, materials, activities) available in the "natural" preschool environment (Hart & Risley, 1968). Not only did the research results show generalization of the language behavior trained (use of adjectives), they

suggested that language training, at least for this population, might be conducted as (or more) effectively directly within the setting in the first place.

The research then undertaken at Turner House Preschool showed that language could indeed be trained within the natural environment, without removing children from engagement with non-language learnings to one-to-one language training settings. It was necessary, however, to rearrange the preschool setting so as to make it a model living environment (Risley, 1972). The classroom had to contain a rich variety of attractive and accessible materials that could function as reinforcers for language behavior (Hart & Risley, 1974), and it had to be organized and managed in ways that permitted teachers to focus their efforts on brief, one-to-one interactions with individual children (LeLaurin & Risley, 1972). Only in such an environment can *in vivo* teaching of language occur naturally and often.

In vivo or "incidental teaching" (cf. Hart & Risley, 1975, 1976, 1978) of language can occur in such a "natural" model environment whenever a child initiates an interaction by specifying a reinforcer (attention, material, activity) that an adult can deliver. The adult, prior to delivering the reinforcer, conducts incidental teaching by focusing close attention on the child and asking him or her for elaborated language related to the topic the child has specified. The effectiveness of the incidental teaching process for increasing aspects of language in spontaneous use was demonstrated in two experiments undertaken at Turner House Preschool; each used a multiple-baseline design across selected subcategories of language. In the first experiment (Hart & Risley, 1974), incidental teaching procedures were applied during free play to children's use in spontaneous speech of labels (nouns), of descriptions of materials (adjectives), and of compound sentences describing reasons for use of those materials. The second experiment (Hart & Risley, 1975) replicated and extended the use of incidental teaching to estab-

lish compound sentence usage in spontaneous speech. In both experiments, children's use of the aspects of language targeted in incidental teaching increased markedly when (and only when) incidental teaching procedures were applied. Though the topography of a given response (as that of the compound sentence, "Can I have X so I can Y?") had to be initially prompted and shaped, subsequent use of the response during free play increased through the application of incidental teaching procedures alone (Hart & Risley, 1975). Also, use of the response could be transferred from teachers to children. When teachers used incidental teaching to mediate children's access to preschool reinforcers, the children's use of compound sentences to teachers increased; when other children became the mediators of those reinforcers, children's use of compound sentences to teachers decreased, but increased correspondingly to other children.

Thus, incidental teaching appeared to be a powerful process for increasing the elaboration of children's spontaneous language. It also appeared to be a "natural" process, one used by particularly responsive mothers (White, 1971), and one that incorporated the majority of those stimulus conditions that Stokes and Baer (1977) have recently enumerated as contributing to response generalization. First, incidental teaching is conducted within the very setting conditions that naturally maintain language use. That is, incidental teaching is conducted in a richly varied stimulus environment, full of people, things, and activities to be accessed and manipulated through language use. In the Hart and Risley (1975) study, incidental teaching of compound sentence use was conducted in relation to all the materials and activities, indoors and out, that children specified as reinforcers, when and only when each was so specified by a child. Three teachers and 11 children were involved in incidental teaching in that center.

Second, incidental teaching is conducted casually throughout the child's day, at various times and in various contexts, in relation to whatever

aspect of a varied stimulus environment the child selects as a momentarily prepotent reinforcer. As the child initiates with language related to many different aspects of his environment, many different elaborations are requested. In the Hart and Risley (1975) study, after the first 2 weeks of teaching the topography of the compound sentence ("Can I have X so I can Y?"), the teachers began asking children to state in their compound sentences the "real" reason for requesting a material or access to an activity. They asked, thus, for a reason corresponding to the context of use and so, necessarily, for variation in the content within the structure of a compound sentence.

Third, incidental teaching is by its nature "loose training" (Stokes & Baer, 1977). Adults arrange the context for incidental teaching, but they have little control over the particular stimulus a child will select to initiate about at any given moment. The child in fact controls the incidental teaching interaction because he or she initiates it, specifying a reinforcer the adult can deliver. If the adult withholds the reinforcer, the child in a free play situation can readily turn away, "lose interest" in the reinforcer initially specified, and choose something else. Therefore, the adult must focus on keeping the child initiating rather than on a criterion for a specific response topography. This means keeping the incidental teaching interaction brief, positive, and focused on the child-selected reinforcer. If the child does not produce the "correct" elaboration, the one the adult's question was meant to elicit, the adult must deliver the child-specified reinforcer anyway, and try to think of a more effective prompt for use the next time the child initiates on the same topic. In the Hart and Risley (1975) study, after each child had mastered the response topography of the compound sentence ("Can I have X so I can Y?"), teachers began to attend to only three aspects of a child's compound sentence. They listened for a conjunction ("so" or "because") linking two clauses, for "truth value," the correspondence of stated reason to immediate con-

text (Brown & Hanlon, 1970), and, of course, for the reinforcer specified. Other aspects of the compound sentence could and did vary within a "correct" response, one reinforced by delivery of whichever of the stimuli the child had at that moment selected from the variety of preschool materials, activities, and social interactions available.

Also, fourth, the conditions of incidental teaching are such that the actual contingencies of reinforcement are likely to be much less discriminable than those in a one-to-one training session. The adult conducts incidental teaching only when he or she has both the time and an appropriate, reinforcer-related prompt for elaboration. Therefore, the adult sometimes delivers a child-requested reinforcer without asking for language elaboration; sometimes he or she prompts once, sometimes more than once. Over time, merely the focus of close adult attention when the child initiates is likely to become a discriminative stimulus for elaboration, such that the adult does not have to prompt at all. In the Hart and Risley (1975) study, teachers frequently conducted incidental teaching when several children were all asking for access to, for instance, a new activity. Compound sentences were effectively prompted by the teacher turning first to the child or children who were initiating with compound sentence requests. Both the teacher's differential attention and the modeling of the other children tended to become discriminative for elaborated language (a compound sentence form). Working with a group meant that reinforcement was sometimes delayed until the teacher "got around" to a child who had already asked for a material in a compound sentence. The teacher sometimes even reinforced noncompound sentence usage, by delivering a material to a child who had originally asked for it using a compound sentence but had gone on, while waiting, to say something else.

Perhaps most importantly, incidental teaching establishes a class of behavior, language use, which is likely to be generalized by stimulus similarity across settings and occasions. Not only

does language function differentially to gain access to reinforcers, but language initiation is followed, on an intermittent schedule, by close, receptive adult attention; focus on the reinforcer the child has selected; and often a request for more of the behavior, language. A response class, language *use*, is reinforced in a wide variety of stimulus conditions.

Both because the incidental teaching environment seemed to incorporate many of the conditions conducive to generalization and because of current concern with possible unprogrammed side effects of experimental intervention, we undertook an examination of the rest of the language (all the language other than the compound sentences) the children of the Hart and Risley (1975) study used during free play. An advantage to such an examination was the availability of identically recorded language data from two other preschool settings in which no such intervention had occurred. It seemed possible, thus, to look for indications of differences or changes in language use and/or elaboration among the Turner House children as compared to language use among children who had had no incidental teaching, and to assess, for instance, whether the Turner House children's general use of language had improved in any way, or whether it was perhaps constrained by the months of emphasis on a particular response topography. The present article presents the results of this examination of the side effects of training language in the "natural" environment.

METHOD

Children and Setting

Spontaneous language data were recorded in three settings: (1) Turner House Preschool (TH), an experimental preschool program serving children from a black, economically impoverished community in Kansas City, Kansas; (2) a Head Start (HS) program serving children from the same community as TH; and (3) the Edna A. Hill Child Development Laboratory Preschool at the University of Kansas (KU),

where the children were from white, upper-middle-class families. In each of the three preschool programs, at least three teachers were scheduled to supervise free play. Scheduled to involve a variety of unstructured activities, periods of free play tended to be very similar across the three settings. Only in the TH setting were special procedures (incidental teaching) introduced during free play periods.

Subjects at TH were 11 children, 5 girls (ages 4:8-5:0, average 4:11) and 6 boys (ages 4:8-5:2, average 5:0). Average IQ measured by the PPVT was 75 (range 51-101). At HS 8 children were randomly chosen from a class of 27. There were 4 girls (ages 4:5-4:11, average 4:9) and 4 boys (ages 5:0-5:2, average 5:1). Average IQ was 71 (range 56-99). At KU 12 children were randomly chosen from two afternoon classes of 16 and 17 children each. There were 6 girls (ages 4:9-5:7, average 5:3) and 6 boys (ages 4:9-5:4, average 5:2). Average IQ was 117 (range 99-129).

Measurement

Language data were recorded in all three settings only during free play periods. Recording methods were identical to those described in Hart and Risley (1974). Briefly, an observer wrote down in longhand "everything" said by a child, and to whom the child addressed the utterance, for 15 min, beginning a new line of writing each time a child began a new utterance. A child was judged to have begun a new utterance after a pause of one sec or more, or after changing addressee. One of three observers recorded a 15-min sample of spontaneous speech on every child every day 4 days per week at TH and KU, and 1 day per week at HS. The same three observers recorded at both TH and HS. In each setting, whenever a child was absent, the observer who regularly recorded the speech of that child recorded simultaneously but independently the spontaneous speech of another child along with the regular observer to whom that child was assigned. Such reliability observations were recorded throughout the 9-month

preschool year. Interseting observations were made four times: the TH and KU observers each recorded in the other's setting once in November and once in April.

Data Analysis

Analysis of the observer records¹ was aimed at examining two general classes of behavior, language use and language elaboration. Language use was defined as the occurrence of a

¹In order to illustrate the level of language in use among the children studied, some verbatim examples of sequential sentences (only) have been drawn from the data recorded at each setting early and late in the preschool year. For the sake of brevity only one 5-min segment of the 15 min of recording is presented. The examples were selected as representative of the language used at a particular setting, and the children were chosen as representative of the median rate of language use. Shown are data for child 4 at HS, child 6 at TH, and child 6 at KU (see Table 2). Punctuation has been supplied at the end of each observer-recorded line. Sentences prefaced (T) were recorded as addressed to a teacher; all others were recorded as addressed to another child. All the words *except* those italicized would be computer-counted as different words in the selections presented.

Early in the preschool year:

HS 9/23 last 5 min, child 4. You have this? I ain't playing with you. Look at this. There's one.

TH 10/1 last 5 min, child 6. Somebody want a broom? Here's a towel. Where is? (T) I want one of these cups and plates. (T) I want another saucer.

KU 10/14 middle 5 min, child 6. OK, we'll stand by teacher. Yeah, but someone has to carry it for me. You take one for me. I can't carry that. Put it in your pocket. I'll just throw it down. Take your hand off there, silly. Let's run. (T) I think we're gonna have to go. We should have brought crackers.

Late in the preschool year:

HS 5/5 last 5 min, child 4. Boys ain't suppose to be in here. (T) You got that for your birthday? (T) Fix this.

TH 4/22 middle 5 min, child 6. There's some more worms. That's why John don't want me to mess with 'em. I'm get my batmobile out of here. That was just like that. I gotta get out of here. Get myself straight. Put 'em away. Going under the bridge. I'm in a hurry. (T) I'm in a hurry, teacher.

KU 4/21 last 5 min, child 6. That's Lynn's. (T) I do. Hey, I found another. Didn't I find one? You find your blue? I've got four. I wonder where's some more. (T) Where's some more?

word or a sentence. Elaboration was defined as the occurrence of a different word or of a non-basic sentence type (further definitions given below). Words and sentences were thus used in the present analysis as measures of the occurrence of a response class (language use) rather than analyzed in terms of their topographies. We were interested in the frequencies of particular behaviors (use and elaboration), of which words and sentences are observable instantiations, rather than in the nature or occurrence of words and sentences as linguistic units. To this end, two separate computer processings of the data were made: first, each observer record was analyzed in terms of its words (the word processing) and second, in terms of its sentences (the sentence processing). Both computer processings were designed to yield measures of language use; each was designed in addition to yield a measure of a particular aspect of language elaboration. The two computer processings are described separately below in terms of only those aspects of the data reported in the present paper.

Word Processing

The first analysis of the observer-recorded 15-min language samples was identical to that described in Hart and Risley (1974). Each word in each observer record was coded and key-punched by part of speech. Part-of-speech codes were assigned in accordance with the dictionary definition of the particular word as used in the particular sentence. Parts of speech coded included nouns, verbs, and modifiers. Modifiers included adjectives, adverbs, and quantifiers. The computer counted each coded word in each sample as a word used: This count yielded a measure of the occurrence of the response class, language use. The measure of the occurrence of the behavior, elaboration, was the different word: The computer counted a coded data word as different the first time (only) that the particular word appeared in a particular sample. If the same word reappeared within the same sample, it was computer-counted only as used.

Sentence Processing

Sentences were used as a second measure of the occurrence of the response class, language use. A sentence was defined as an observer-written line (a transcription of an utterance) that contained a verb. Deleted-copula constructions (as, "Where my thing?") were considered to contain a verb. Any written line that had any portion recorded as incomprehensible by the observer was excluded from the sentence processing. Also, in the TH data (only) all compound sentences of the topography targeted in incidental teaching (i.e., "Can I have X so I can Y?"—essentially, the data reported in Hart and Risley, 1975) were omitted from the data in order to look only at the language use not specifically targeted in the intervention program.

In order to assess the occurrence of elaboration, each sentence in each observer record was assigned to one of four sentence types. Codes for the four sentence types were defined for two purposes. First, we wanted to look at children's use of different kinds of sentences for elaboration, as separated as possible from their use of different words for elaboration. In this sense, simple, active, affirmative, declaratives and imperatives may be seen as basic response units which are combined, or to which other response units are added, in order to produce more elaborated and complex effects on the environment. Complex sentence structures are used, it is assumed, because they are differentially effective in terms of listener response. For instance, polite forms are more efficient than direct demands with certain people in certain circumstances. A complex sentence, such as "I don't like people bothering me when I'm painting," is likely to work somewhat differently than a basic statement, e.g., "Leave me alone." An implied threat, as, "If you don't stop doing that you're gonna get hit," is likely to work differently than a direct one such as "Stop or I'll hit you." Over and above important differences in their detail and the specific information they contain (that is, in dimensions of vocabulary and reference) more

elaborated and complex sentences seem to be more efficient, behaviorally, for transmitting information. They take fullest advantage both of the listener's (perhaps momentary) attention and of the relationships inherent in the structure of language. The first purpose of selecting the categories for coding sentences, then, was to delineate some general ways that different types of sentences can be used to elaborate the effects, or the effectiveness, of language use.

The second purpose in defining the categories for sentence coding was reliability. We needed observable parameters that would correspond to the theoretical differences in elaboration discussed above, parameters that two or more data coders could readily discriminate and agree on. Therefore, in order to obtain a consistently reliable data base and reduce judgment calls, the different sentence types were defined in terms of grammatical features, as defined by Hathaway (1967). However, no linguistic or syntactic analysis of the sentences in the data was intended, and no statements can or will be made on the basis of the present data concerning the children's linguistic competence or knowledge of grammatical rules. Our concern is solely with the reliable delineation of some dimensions of the behavior, language elaboration.

The four categories of sentence codes are as follows. Defined as Elaborate sentences were all the sentence types other than the Basic: that is, all Addition, Combination, and Complex sentences, taken together, defined the category, Elaborate sentences. Each sentence in the data was assigned to one of the following four types:

1. *Basic sentences.* Coded as Basic sentences were all simple, active, affirmative, declaratives and imperatives. Examples are: Stop that; Here we go; Now let's do something else; It's raining outside; I'm keeping the cockroaches off the floor. Such sentences were considered basic response units; in using them a child may be said to be interacting with the environment in direct and straightforward ways, calling a spade, for instance, "a tool."

2. *Addition sentences.* Coded as an Addition sentence was any sentence containing one (only) of the following: negative, question, adjective modifying a noun, participle, passive, appositive, infinitive. Examples of Addition sentences are: It's not raining outside; Where are we going?; I'm gonna put the big bike away; Stop doing that; You gonna get locked in the cage again; Leave the door closed; It's time to go. Such sentences add another unit to a basic response unit, and permit interacting with the environment in somewhat more elaborate ways. In using an Addition sentence a child may be said to be elaborating language use in order to comment on both immediate, observable stimuli and their relationship to other, perhaps less immediate stimuli, calling a spade, for instance, "not a shovel," or "a tool for digging."

3. *Combination sentences.* Coded as a Combination sentence was any sentence containing one (only) of the following: coordination, adverbial clause, relative clause, noun clause. Examples are: This goes hot and cold; I'll give it to you when I get through; That's why I hit you; My mama said she'd buy me one of those. Such sentences combine two basic response units; as such they result in a different response unit than Addition sentences, but not necessarily a more elaborate or more efficient one. As in using an Addition sentence, a child using a Combination sentence may be said to be elaborating language use in order to display particular kinds of relationships (temporal or causal, for instance), calling a spade, for example, "a tool man has invented."

4. *Complex sentences.* Coded as a Complex sentence was any sentence that contained both Addition and Combination, or two or more Additions, or two or more Combinations. Coded as Complex sentences were, for instance, all negative questions, all sentences containing two subordinate clauses, and all sentences containing both a subordinate clause and a negative. Examples of Complex sentences are: Why don't you stop pushing?; I know what we should play with when this is done; If you don't stop doing

that I'ma tell my big brother to come over your house and beat you up. In using such Complex sentences, a child may be said to be elaborating language use in order to comment on several kinds of relationships simultaneously, calling a spade, for instance, "a tool man has invented for digging."

Though the definitions used in assigning the sentences to categories were linguistic ones, the categories themselves were intended to characterize elaboration more as a social, than as a grammatical, behavior. Thus, Elaborate sentences are seen to represent elaboration not in terms of a hierarchy of skill levels but (after Halliday, 1978) in terms of the different kinds of things language can do in social interaction. It is the social purposes of language, for instance, that lead older preschool children to increasingly adapt language use to the needs of listeners, through modulation (explanation, justification) (Schachter, Kirshner, Klips, Friedrichs, & Sanders, 1974). We wanted to look at language in terms of social function, both because of the compatibility of this approach with those of Skinner (1957) and Halliday (1978) and because the children studied were all at an age when the acquisition of syntax is largely complete (Menyuk, 1969). (For instance, children at all three settings produced numbers of passives, which are complex grammatically, but not socially; see Watt, 1970.) In addition, because of the populations studied (lower-class black and middle-class white), we wanted an approach to elaboration that would be equally applicable across subcultures.

Each sentence in each observer record was coded into one of the four categories. Four people coded the sentences in each child's data by hand-separating into categories the cards on which the sentences had been keypunched. The coders exchanged data and reviewed the accuracy of one another's coding in terms of the category definitions three times; then all the data were again checked for coding accuracy by one of the present authors. Prior to the word processing, the coding by part of speech was similarly

done: one of three people checked the key-punched data and its coding against the raw data prior to a final review. Because of the repeated review of the coding accuracy, no reliability assessments were made. Only later, when subsequent data were coded according to the same category definitions, was coding reliability assessed. The person who did the final review of the coding on that occasion noted as a disagreement each correction made to the initial coding. Total agreements (uncorrected codes) were divided by total agreements plus disagreements (total codes) for each of 155 language samples. The average agreement on the sentence codes was .92 (range .73-1.00 per sample); the average agreement on the word coding was .96 (range .68-1.00).

Comparison Across Setting

The language data from the TH, HS, and KU settings were compared, first, in order to assess whether there were any changes, good or bad, in the language behavior of the TH children associated with the incidental teaching of compound sentences. Second, we were interested in whether there were differences in the ways middle-class and disadvantaged children use language to interact with their environments. To assess the extent to which children in each of the three settings used language as a class of behavior for affecting the environment, we compared the numbers of total words and total sentences produced per 15-min sample across settings. To assess the elaboration of the behavior, language use, across settings, we compared the numbers of different words and of Elaborate sentence types used per 15-min sample. We also compared the language contexts of the three settings, in terms of where language use and language elaboration occurred (indoor or outdoor free play) and to whom (teacher or child).

Data were obtained in the HS setting only once per week on Mondays; therefore, language use at all three preschool settings could be compared only on the first school day of each week across the 9-month preschool year. The first

school day of each week for each school is here called Monday despite the fact that at TH the first school day of each week was actually Tuesday. Data were recorded at HS on Monday, at TH on Tuesday. Some Mondays were omitted from the analysis due to incomplete data. Of the 31 successive Mondays of data recording at TH (September 23 to May 16), 25 Mondays could be compared to HS and KU Mondays. Omitted were: 1 Monday in mid-October, 1 in November (Thanksgiving), 1 in December (Christmas), 2 in January (KU semester break), and 1 in April (KU spring break).

To compare language use across the three settings at the beginning and at the end of the preschool year, certain of the data were summarized by averaging across only the first five Mondays and the last five Mondays for each setting. This enabled comparison of data recorded at TH when incidental teaching of compound sentences was not in force. The first five

Mondays were, at all three settings, those of September 23 to October 29; the last five Mondays were those of April 14 to May 13. Incidental teaching of compound sentence usage began at TH the week of November 19 and ended April 19. Prior to November 19 and following April 19, incidental teaching was conducted but was targeted on use of labels.

Recording Reliability

Each reliability sample, recorded as described above, was coded and computer-processed at the same time as, and in a manner identical to, that of the prime observer's record. Reliability coefficients for the dimensions of language under consideration here are shown in Table 1. The top portion of the table shows the reliability coefficients derived from the word processing of all the reliability samples recorded at each setting over the entire preschool year. The lower portion of the table shows the reliability coefficients

Table 1
Reliability Coefficients^a

<i>A. Word processing (all year)</i>						
<i>Number of reliability samples</i>	<i>Setting</i>	<i>Number used per child per sample of:</i>				
		<i>Total words</i>	<i>Different words</i>	<i>Different verbs</i>	<i>Different nouns</i>	<i>Different modifiers</i>
127 total	Interobserver at TH					
12 per child	average:	.95	.95	.94	.95	.90
average	range:	.00-1.00	.00-1.00	.00-1.00	.00-1.00	.00-1.00
7-25 range	zero instances ^b :			1-2	3-4	7-9
20 total	TH observers with KU at TH					
2 per child	average:	.74	.84	.90	.76	.90
1-3 range	range:	.15-1.00	.21-1.00	.00-1.00	.25-1.00	.33-1.00
	zero instances:			1-2	2-2	3-3
	(observer 1—observer 2)					
83 total	Interobserver at KU					
7 per child	average:	.95	.93	.99	.97	.95
4-14 range	range:	.27-1.00	.24-1.00	.43-1.00	.00-1.00	.38-1.00
	zero instances:			0-0	2-0	0-0
24 total	TH observers with KU at KU					
2 per child	average:	.75	.79	.79	.76	.82
1-3 range	range:	.46-.97	.54-1.00	.39-1.00	.36-1.00	.40-1.00
	zero instances:			0-0	0-0	0-0
32 total	Interobserver at HS					
4 per child	average:	.99	.96	.99	.87	.99
3-7 range	range:	.00-1.00	.00-1.00	.00-1.00	.00-1.00	.00-1.00
	zero instances:			1-0	3-4	5-4

Table 1 continued
B. Sentence processing (Mondays only)

Number of reliability samples	Setting	Number used per child per sample of:						
		Sentences to:		Total sentences	Sentence types			
		Teacher	Child		Simple	Addition	Combi- nation	Complex
28 total 3 per child 1-6 range	Interobserver at TH average: range: zero instances:	.89 .28-1.00	.93 .50-1.00	.99 .40-1.00	.91 .35-1.00	.83 .00-1.00	.79 .00-1.00	.90 .00-1.00
8 total 1 per child 0-1 range	TH observers with KU at TH: average: range: zero instances:	.96 .00-1.00	.78 .37-1.00	.81 .35-1.00	.84 .30-1.00	.85 .33-1.00	.82 .33-1.00	.89 .33-1.00
17 total 2 per child 1-4 range	Interobserver at KU average: range: zero instances:	.93 .08-1.00	.91 .07-.99	.99 .50-1.00	.87 .30-1.00	.87 .00-1.00	.77 .00-1.00	.95 .00-1.00
24 total 2 per child 1-3 range	TH observers with KU at KU average: range: zero instances:	.78 .50-1.00	.87 .50-1.00	.86 .31-1.00	.85 .17-1.00	.91 .32-1.00	.94 .00-1.00	.71 .00-1.00
29 total 4 per child 2-7 range	Interobserver at HS average: range: zero instances:	.97 .00-1.00	.99 .28-1.00	.88 .00-1.00	.84 .00-1.00	.94 .00-1.00	.78 .00-1.00	.86 .00-1.00

*All coefficients were obtained by dividing interobserver agreements by agreements plus disagreements on the category named.

^bZero instances: observer 1-observer 2.

derived from the sentence processing of only those reliability samples recorded on Mondays. Each reliability coefficient was derived by averaging the quotients of the smaller divided by the larger counts for each 15-min child sample for the given category. Reliability coefficients for individual samples were approximately equivalent across children at each setting both early and late in the preschool year. Because of their relevance to the reliability coefficients, the numbers of zero instances are indicated for some of the language dimensions shown in Table 1. Zero instances occurred when one or both observers recorded no instance of a particular lan-

guage dimension during the 15 min of observation.

RESULTS AND DISCUSSION

The purpose of the present study was to examine in a "natural" preschool free play environment language behavior that had never been subject to specific training. The Hart and Risley (1975) study had shown that a particular response topography (the compound sentence) could be effectively trained in the "natural" environment through incidental teaching, and that use of the topography trained would

generalize across settings, materials, and people. Now we wanted to look at the rest of the language used by the children who were the subjects of intervention in the Hart and Risley (1975) study. That is, we wanted to look at the use and elaboration that occurred within the context of training, but which had not been specifically targeted in training. Analysis of the language data, from which all compound sentences of the trained topography had been excluded, revealed major increases in rates of language use among the TH children across the preschool year. These increases in rate of language use were accompanied by corresponding increases in elaboration, in the numbers of dif-

ferent words and complex sentences used. The TH children, who were comparable to their disadvantaged peers at HS in terms of both rates of use and of elaboration at the beginning of the preschool year, were much more comparable to the advantaged children at KU at the end of the preschool year. Marked changes in rates of language use and elaboration, which were general across contexts and people, occurred only at TH—the setting in which incidental teaching had also occurred.

The results of the word processing of the language data are shown in Figure 1. Figure 1 shows the average numbers per child per 15-min sample of total words (top) and different words

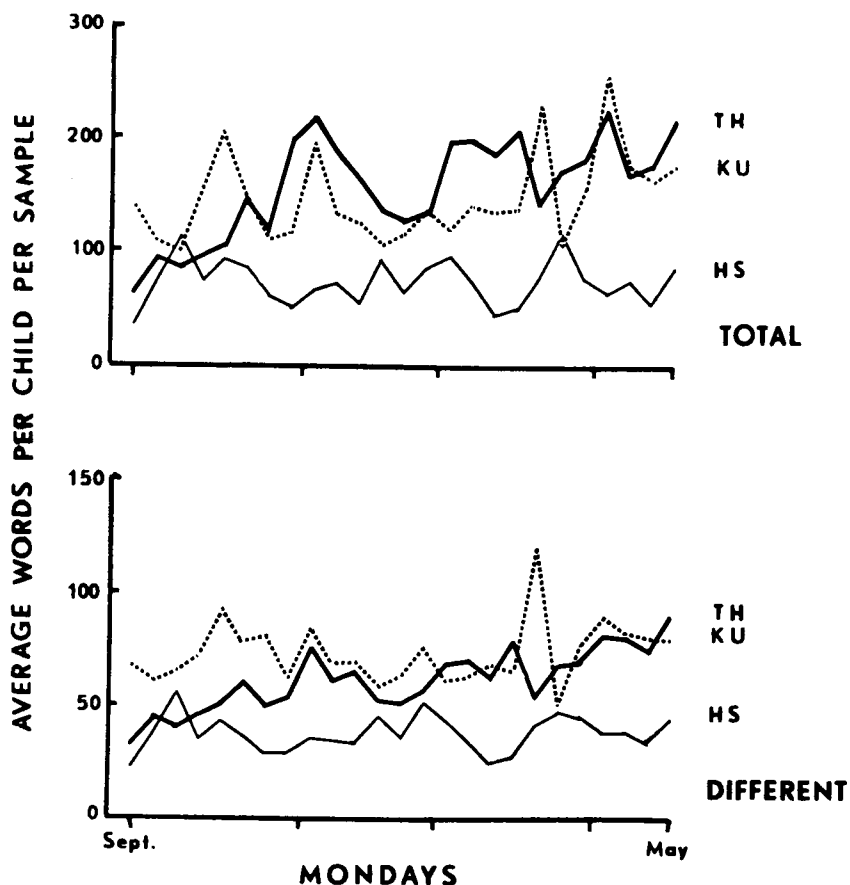


Fig. 1. Average numbers per child per 15-min sample of total words (top) and different words (bottom) recorded as used during preschool free play on the first day (Monday) of each of 25 successive preschool weeks from September to May, in three preschool programs. Programs were: TH (heavy solid line), a language intervention program serving disadvantaged children; HS (light solid line), a Head Start program serving disadvantaged children from the same community as TH; KU (dotted line), a program serving advantaged children at the University of Kansas.

(bottom) used on the first day (Monday) of each of 25 weeks across the preschool year from September to May. Vertical lines on the abscissa indicate experimental periods at TH: first, the shift in incidental teaching from targeting labels to targeting compound sentences directed to teachers; second, the shift in incidental teaching from compound sentences directed to teachers, to compound sentences directed to children; and third, the resumption of incidental teaching targeted on labels only (no elaboration required). The successive days shown in Figure 1 are not identical to those shown in Hart and Risley (1975) because certain Mondays (see above) were omitted from the present data in order to permit comparison with the data recorded at the HS and KU settings.

The top graph in Figure 1 displays the average frequency of the behavior, language use, across the preschool year at each of the three settings. A marked increase in language use, in terms of total numbers of words used per child on the average per sample across the preschool year, occurred at TH, alone of the three settings. The average number of total words used per child per 15-min sample at TH increased from an initial (first five Mondays) average similar to that among the HS children to an end-of-the-year (last five Mondays) average much more similar to that among the KU children. The average words used per child per sample at TH more than doubled from the beginning to the end of the preschool year whereas the average words used per child per sample remained largely unchanged at both HS and KU. The average numbers of words used per child per sample remained relatively low at HS, and relatively high at KU. The average numbers of words recorded per 15-min sample for each individual child in each of the three settings over the first five Mondays and over the last five Mondays of the preschool year are shown in Table 2.

The bottom graph in Figure 1 displays the average frequency of language elaboration across the preschool year at each of the three settings,

and shows that as language use (average total words per child per 15-min sample) increased over the preschool year at TH, so also did elaboration (the average numbers of different words used per child per sample). At HS and KU, in contrast, the average numbers of different words used per child per sample changed little across the preschool year. The average number of different words used per child per 15-min sample for the first and last five Mondays at each setting is shown in Table 2.

Figure 2 displays language elaboration (the use of different words) in more detail, showing the average numbers of different contentive words—verbs, nouns, and modifiers (adjectives, adverbs, quantifiers) used per child per sample over the first (left) and the last five Mondays (right) of the preschool year at each of the three settings. The initial similarity between average performance at TH and HS may again be seen, along with the final similarity between average performance at TH and at KU. Also apparent is that a marked increase in average use of different contentive words occurred only at TH.

The results of the sentence processing of the data are shown in Figure 3. In the sentence processing, it will be recalled, all compound sentences of the topography trained through incidental teaching (i.e., "Can I have X so I can Y?") were omitted from the TH data. Figure 3 shows the average numbers per child per 15-min sample of total sentences (top), of Basic sentences (middle), and of all Elaborate sentences (bottom) used in each of the three settings on the first day (Monday) of each of 25 sequential preschool weeks from September to May. Vertical lines on the abscissa indicate experimental periods at TH, as in Figure 1.

The top graph in Figure 3 displays the second, sentence, measure of the average frequency of the behavior, language use, across the preschool year at each of the three settings. (The average numbers of sentences recorded for individual children across the first and last five Mondays of the preschool year are shown in

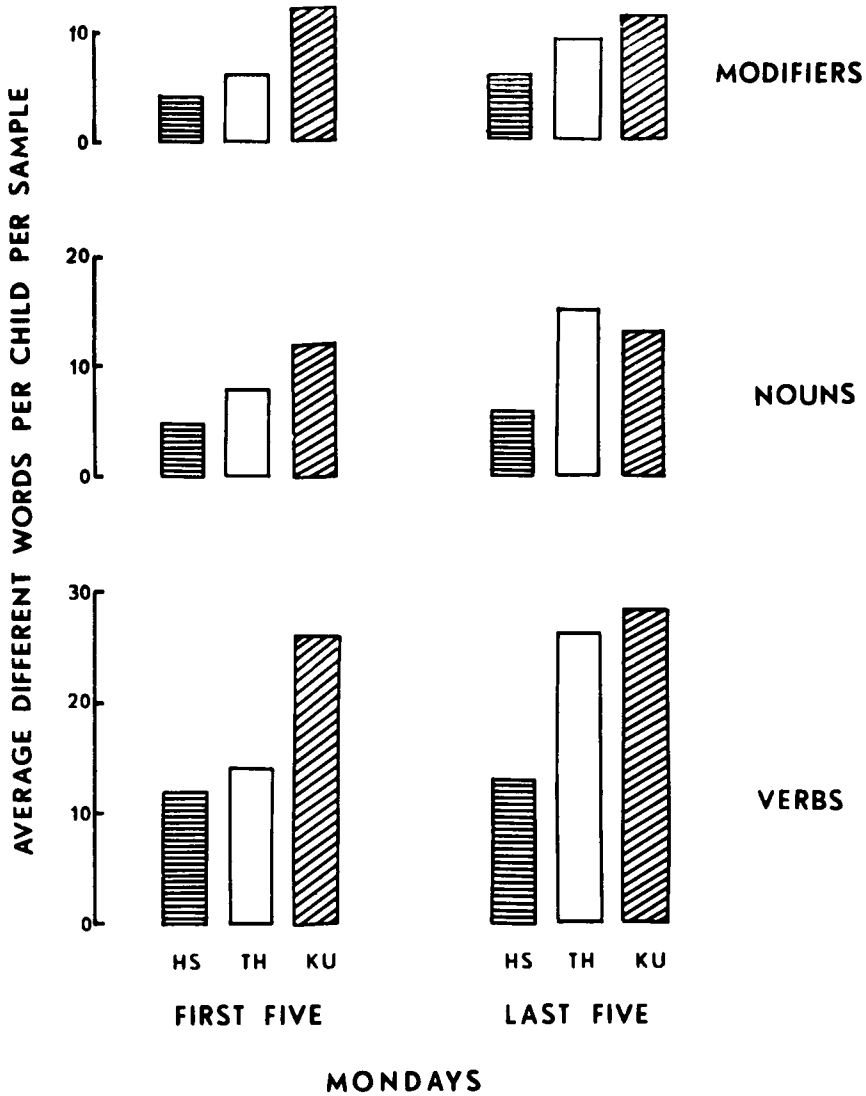


Fig. 2. Average numbers per child per sample of different contentive words—different verbs (bottom), different nouns (middle), and different modifiers (adjectives, adverbs, quantifiers) (top)—recorded as used during preschool free play over the first five Mondays (left) and over the last five Mondays (right) of the preschool year in the three preschool programs.

Table 2.) It is apparent that the marked increase in rate of language use which occurred at TH in terms of numbers of words used also occurred in terms of numbers of sentences produced. At both HS and KU the average rates of producing sentences, like the average rates of producing words, changed little over the preschool year. The middle graph in Figure 3 shows the average number of Basic sentences used per child per 15-min sample at each of the three

settings. Again, the increase in use at TH across the preschool year is apparent, in contrast to the relatively small changes in use of basic sentences at HS and KU. The bottom graph in Figure 3 displays the average frequency of language elaboration. As language use (average total sentences used per child per sample) increased over the preschool year at TH, language elaboration also increased, in terms of the average number of Elaborate (all Addition, Com-

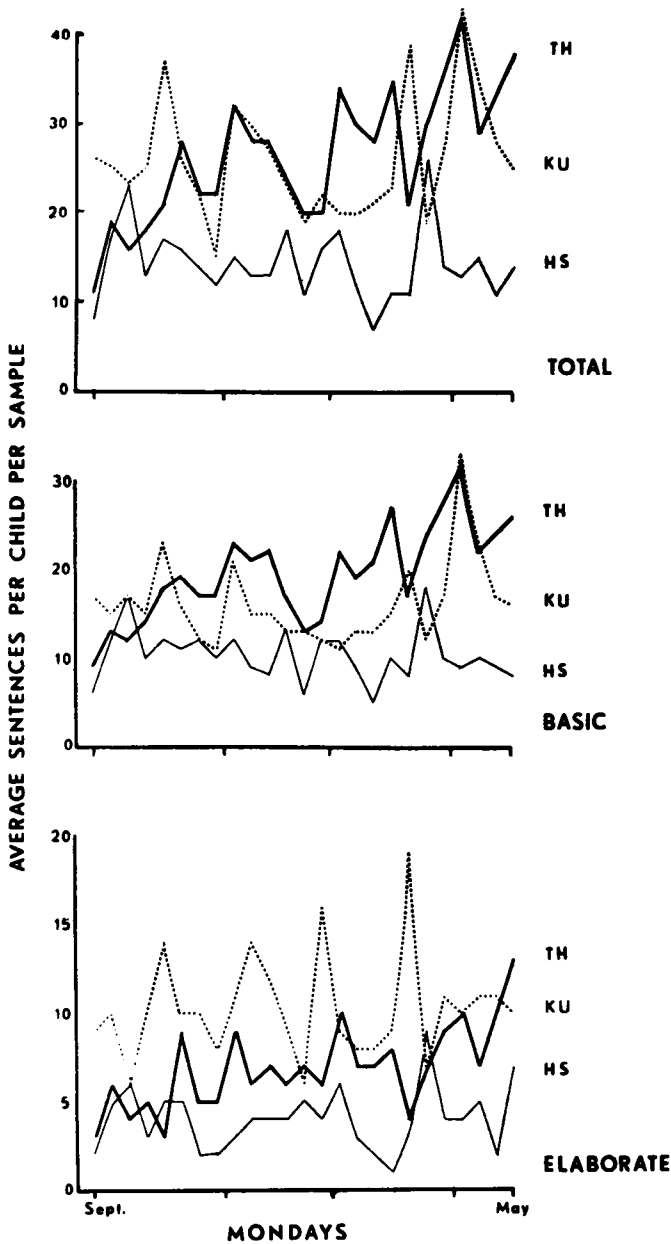


Fig. 3. Average numbers per child per 15-min sample of total sentences (top), of Basic sentences (middle), and of Elaborate sentences (bottom) recorded as used during preschool free play on the first day (Monday) of each of 25 successive preschool weeks from September to May, in the three preschool programs. See text for definitions of Basic and Elaborate sentences.

ination, and Complex) sentences used per child per 15-min sample. At HS and KU, there was little change in the average number of Elaborate sentences used per child per sample over the preschool year.

Figure 4 displays language elaboration (the

use of Elaborate sentences) in more detail, showing the average numbers of Addition, Combination, and Complex sentences (the three types of Elaborate sentences) used per child per 15-min sample over the first five Mondays of the preschool year (left) and over the last five Mon-

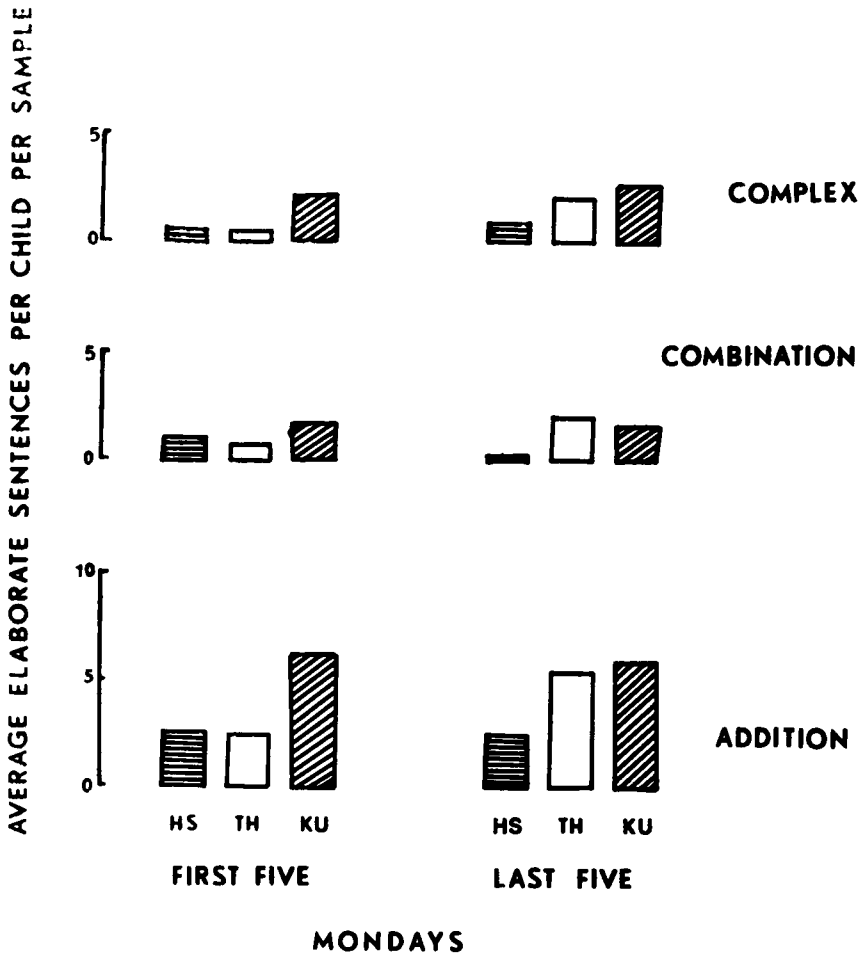


Fig. 4. Average numbers per child per 15-min sample of the three categories of Elaborate sentences—Addition (bottom), Combination (middle), and Complex (top) sentences—recorded as used during preschool free play over the first five Mondays (left) and over the last five Mondays (right) of the preschool year in the three preschool programs. See text for definitions of the three types of Elaborate sentences.

days of the preschool year (right) at each of the three settings. Again the initial similarity between average performance at TH and at HS may be seen, along with the final similarity between average performance at TH and KU. Also apparent is that a marked increase in average use of the more elaborated sentence types occurred only at TH.

Table 2 shows the average numbers of sentences of each type (Basic, Addition, Combination, Complex) and total number of sentences recorded per sample for each child in the three settings during the first and last five Mondays of the preschool year. For the TH children, all

compound sentences of the topography trained through incidental teaching have been omitted from the data. Table 2 makes clear, first, the range among the children at the three settings. The TH group of children was much more heterogeneous in terms of average rate of language use than were the children in either the HS or the KU settings, and this diversity in performance did not change substantially across the preschool year. Second, Table 2 shows that the increases in use of sentences of all types, and particularly of the Elaborate sentence types, were general across the group at TH except for the child with the highest initial rate. Also, the

Table 2

Average number of total words, of different words, and of sentences by total and each type recorded per 15-min sample for each child in each setting over the first five and the last five Mondays of the preschool year.¹

Child	Setting					
	HS		TH		KU	
	First 5	Last 5	First 5	Last 5	First 5	Last 5
TOTAL WORDS						
1	92	73	202	235	276	221
2	103	80	176	356	152	237
3	68	104	125	264	153	164
4	73	67	118	240	212	212
5	59	42	71	165	190	231
6	64	95	77	137	176	159
7	16	51	52	112	150	112
8	8	41	65	181	157	184
9			54	205	107	61
10			28	110	140	132
11			9	29	125	183
12					94	118
	average: 60	69	89	185	161	168
DIFFERENT WORDS						
1	50	40	94	100	149	104
2	49	42	79	121	71	104
3	36	53	63	107	77	85
4	32	41	60	97	93	99
5	30	24	40	64	96	106
6	43	62	35	69	74	80
7	11	28	28	58	76	57
8	7	29	22	63	66	88
9			28	83	44	37
10			21	51	70	65
11			5	25	59	87
12					47	69
	average: 32	40	43	76	77	82
TOTAL SENTENCES						
1	24.1	13.9	37.4	35.0	42.5	39.2
2	17.2	18.4	31.9	64.4	38.5	38.1
3	15.4	19.8	24.4	46.2	35.8	30.1
4	12.4	11.3	22.2	45.0	34.7	38.3
5	12.0	7.2	16.2	25.2	29.8	40.9
6	9.0	15.6	14.8	30.6	29.3	24.7
7	4.9	10.9	12.8	22.8	24.6	25.0
8	1.8	6.3	11.8	41.6	24.5	17.3
9			10.0	37.4	23.2	10.0
10			5.2	24.6	23.0	23.4
11			1.8	6.3	22.2	29.3
12					16.6	19.0
	average: 12.1	12.9	17.1	34.5	28.7	27.9
BASIC SENTENCES						
1	18.0	10.5	25.4	21.6	21.5	24.8
2	11.8	13.8	23.3	48.0	19.5	24.7
3	9.3	14.4	18.0	27.6	20.8	18.0
4	8.4	8.0	16.0	32.4	22.3	22.3
5	10.0	3.8	14.2	18.8	22.6	27.8
6	4.8	8.5	9.4	25.3	15.0	17.0

Table 2 *continued*

Child	Setting					
	HS		TH		KU	
	First 5	Last 5	First 5	Last 5	First 5	Last 5
7	3.8	8.3	11.2	17.8	16.8	16.0
8	1.5	4.8	9.3	32.2	15.5	11.0
9			8.6	29.0	15.3	7.3
10			4.6	20.0	9.0	14.0
11			1.8	4.7	17.6	19.5
12					10.0	13.0
average:	8.5	9.0	12.9	25.2	17.2	18.0
ADDITION SENTENCES						
1	5.0	1.8	3.0	5.8	8.0	6.8
2	3.6	3.8	5.5	6.4	9.5	7.7
3	4.0	3.6	4.4	11.0	11.0	8.3
4	2.4	2.0	3.6	9.2	8.3	9.5
5	.5	1.3	1.2	4.8	3.0	8.0
6	2.8	4.8	4.0	3.5	10.3	4.7
7	.8	1.3	1.4	1.4	6.5	3.3
8	.0	1.5	2.5	5.6	5.0	3.3
9			1.4	5.2	4.3	1.7
10			.4	3.0	8.0	5.3
11			.0	1.3	2.8	5.5
12					3.6	4.3
average:	2.4	2.5	2.5	5.2	6.7	5.7
COMBINATION SENTENCES						
1	.8	.8	3.0	2.2	6.0	2.3
2	1.0	.5	.8	6.4	5.0	1.7
3	1.3	.0	.8	4.0	1.8	1.0
4	1.6	.5	1.4	1.2	1.3	2.0
5	1.0	.8	.8	1.0	2.0	1.3
6	.8	.3	1.0	.3	1.5	1.7
7	.0	.0	.0	1.6	.5	3.7
8	.3	.0	.0	2.6	2.0	.7
9			.0	1.8	1.3	.3
10			.2	1.0	5.0	2.3
11			.0	.0	1.0	2.3
12					1.0	.7
average:	.9	.4	.7	2.0	2.4	1.7
COMPLEX SENTENCES						
1	.3	.8	6.0	5.4	7.0	5.3
2	.8	.3	2.3	3.6	4.5	4.0
3	.8	1.8	1.2	3.6	2.2	2.8
4	.0	.8	1.2	2.2	2.8	4.5
5	.5	1.3	.0	.6	2.2	3.8
6	.6	2.0	.4	1.5	2.5	1.3
7	.3	1.0	.2	2.0	.8	2.0
8	.0	.0	.0	1.2	2.0	2.3
9			.0	1.4	2.3	.7
10			.0	.6	1.0	1.8
11			.0	.3	.8	2.0
12					2.0	1.0
average:	.6	1.0	1.0	2.0	2.5	2.6

¹The children at each setting are ordered according to average number of total sentences used over the first five Monday samples.

TH children with relatively low initial rates of language use (child 5, child 10) showed the greatest gains in terms of both overall rate of language use and of Elaborate sentence use. No such general changes are apparent in average performance at either HS or KU. At both of these settings, individual children's patterns of language use tended to remain very similar across the preschool year (except for some tendency to regression to the group mean).

To assess the significance of the differences in language use and language elaboration seen across settings and time, *t* tests were performed using the per-child averages shown in Table 2. As may be seen in Table 3, only at TH was there a highly significant difference in rate of language use and language elaboration at the end of the preschool year versus at the beginning of the year. In the early weeks of the preschool year, the rates of language use and language elaboration among the advantaged children at KU were significantly different from rates at both HS and TH; at the end of the pre-

school year, however, there was no significant difference between the groups at KU and at TH in average rates of language use and elaboration, but rates of use at both KU and TH were significantly different from rates of use and elaboration at HS.

Table 4 shows the average numbers of total sentences and of Elaborate sentences recorded per sample over the first five and the last five Mondays in each of the three settings which were (top) addressed to other children versus to teachers, and which were (bottom) recorded during indoor versus outdoor free play. The averages shown in Table 4 are not equal to those shown in Table 2 because in Table 4(A), all sentences recorded as addressed to Other (both teacher and child, self, or anyone) have been omitted, and the 5-day averages shown in Table 4(B) necessarily include three samples from some children and two from others, because children were rotated every other day for observation indoors and out. All compound sentences of the type trained through incidental teaching

Table 3
Differences Within and Between Settings Early and Late in the Preschool Year

	<i>Total words</i>	<i>Different words</i>	<i>Total sentences</i>	<i>Elaborate sentences</i>
Between settings: EARLY				
Average per Monday				
First Five Weeks				
KU-HS $t(18) = 5.17^{**}$		4.30 ^{**}	5.52 ^{**}	5.23 ^{**}
KU-TH $t(21) = 3.26^*$		3.11 [*]	3.54 ^{**}	4.88 ^{**}
TH-HS $t(17) = 1.29$		1.19	1.63	1.72
Between settings: LATE				
Average per Monday				
Last Five Weeks				
KU-HS $t(18) = 4.91^{**}$		5.18 ^{**}	4.48 ^{**}	5.62 ^{**}
KU-TH $t(21) = .50$.73	.73	1.42
TH-HS $t(17) = 3.62^*$		3.56 [*]	4.19 ^{**}	3.75 ^{**}
Within settings: EARLY-LATE				
Average per Monday				
First Five Weeks				
Last Five Weeks				
KU-KU $t(11) = .55$.78	.57	1.25
TH-TH $t(10) = 6.31^{**}$		8.24 ^{**}	5.24 ^{**}	4.66 ^{**}
HS-HS $t(7) = .91$		1.63	.42	.37

* $p < 0.005$.

** $p < 0.001$.

Others = NS.

have been omitted from the TH data. Table 4 shows that the increases in use of more complex sentences which accompanied the increases in total sentence production at TH were general across both persons and settings. When the rate of language use increased at TH, not only did the elaboration of language in use increase, but those increases in elaboration occurred both to children and to teachers, both indoors and out.

In order to assess in a general way the kinds of work the children were doing with language at the three settings, the number of mands and tacts were counted in the language records from the first five and the last five Mondays of the preschool year. A mand was defined as a statement which "specifies its reinforcement" (Skinner, 1957, p. 36); counted as mands were all requests for action, attention, compliance, or information. A tact was defined as "verbal behavior evoked by a stimulus" (Skinner, 1957, p. 82); all assertions, descriptions, and explanations were counted as tacts. Overall, no differences were found either across settings or across the preschool year. Both on the first five Mondays and on the last five Mondays of the preschool year, statements at all three settings averaged approximately 40% mands to 60%

tacts, with slightly more mands (45%) directed to teachers and slightly fewer mands (35%) directed to other children. Individual variation could be attributed primarily to rate: When only one or two statements were recorded for a particular child within a 15-min observer sample, they were very likely to be mands.

To summarize so far, the results of the data analysis showed that the only major changes that occurred across a preschool year occurred at TH in terms of rates of general language use and language elaboration. At TH when rates of language use increased, language elaboration also increased. In fact, there was a striking relationship between general language use and language elaboration across all three groups of children, and within groups at each setting. A Pearson rho calculated for the correlation between the average number of words used per sample and the average number of different words used per sample over the entire preschool year was for TH, .98; for HS, .96; and for KU, .99. The Pearson rho calculated for the correlation between the average number of sentences used per sample and the average number of Elaborate sentences used per sample over the entire preschool year was for TH, .82; for HS,

Table 4
Average numbers, by addressee and free play context, of total and Elaborate sentences recorded per sample over the first five and the last five Mondays at each setting.

	HS		TH		KU	
	First 5	Last 5	First 5	Last 5	First 5	Last 5
<i>A. Average number of sentences recorded per sample by addressee.</i>						
Addressed to other children:						
Total	15.6	8.0	8.5	20.4	17.0	19.6
Elaborate	4.4	3.2	2.2	5.9	6.6	6.4
Addressed to teachers:						
Total	1.4	1.5	7.6	12.6	8.6	8.0
Elaborate	.4	.2	1.7	3.1	3.3	3.5
<i>B. Average number of sentences recorded per sample by context.</i>						
Indoor free play:						
Total	12.6	4.2	9.3	17.1	17.0	14.3
Elaborate	4.0	1.8	2.7	4.8	6.4	5.4
Outdoor free play:						
Total	4.8	6.3	8.0	18.6	10.9	14.0
Elaborate	1.0	1.6	1.6	4.8	3.9	4.9

.70; and for KU, .86. There appears to be a systematic relationship between rate of use and elaboration; either children with more elaborated language tend to talk more, or children who talk more tend to produce more elaborated language.

The significant changes in language use seen among the children at TH raise the question of why such changes occurred. There are several possibilities. First, the changes may have been an artifact of the measurement system if the data are not truly representative of the children's behavior. The reliability checks, both inter- and intra-setting, however, indicate that the observers' behavior did not change across the year. Also, there were no systematic differences between the number of words recorded per child per sample across the entire preschool year and the number of words recorded per child per reliability sample.

A second measurement variable may have been intelligibility. The end-of-the-year difference between the language recorded at TH and that recorded at HS could have resulted, for instance, if the observers could hear and understand the TH children considerably better. Counts of the numbers of recorded CUs (the observer code for a word or words which could not be heard or understood; hence, language that was not included in the data at any setting) indicated, however, that very little of the language, at any of the three settings, was incomprehensible or inaudible to the observers. The average number of CUs recorded per child per sample over the first and last five Mondays was at HS, 4 and 8; at TH, 3 and 7; and at KU, 6 and 9.

A second possibility is that because the TH and HS children were neither matched nor randomly assigned to groups, the significant changes in language use were seen because the TH children were significantly different from the HS children in terms of language potential. However, the initial average rates of language behavior were not significantly different in the two groups, and the children were comparable in

terms of age, socioeconomic status (parental income below the poverty level), community residence, and IQ as measured by the PPVT. Also, the heterogeneity in language use within the TH group suggests that the TH children were not, as a group, more promising candidates for preschool experience than were the HS children.

A third possibility is that the programs at the three settings were functionally different. Though all three settings had very similar free play activities available to children, there were indeed differences between the three settings in terms of numbers of children (16-17 at KU, 27 at HS, 11 at TH); teacher characteristics and educational background; the richness, arrangement, and management of the physical environment as a setting to support conversation, and the activities (other than free play) conducted with children. These differences undoubtedly influenced the amount and kind of language used at the three settings; unfortunately (in view of the unanticipated differences seen in language behavior), no measures of these variables were obtained.

The most obvious difference among the programs at the three settings was, however, a planned difference: A program of intervention, incidental teaching, was conducted during free play at TH. One phase of that intervention was specifically directed to generalizing learned language to persons other than those who had directly taught it. Therefore, we undertook to examine whether the change in language use among the TH children could have been, at least in part, the effect of incidental teaching. Because it is assumed that at all three settings the teachers interacted with children in ways likely to increase or maintain the frequency of language use, we chose to look at that aspect of the TH children's behavior that could be uniquely attributed to general effects of the incidental teaching intervention—the children's spontaneous talk to each other.

In the intervention program (see Hart & Risley, 1975), after 9 weeks of conducting inci-

dental teaching of labels (names of objects, etc.) to teachers and 10 weeks of conducting incidental teaching of compound sentences directed to teachers, incidental teaching was shifted to promoting use of compound sentences to other children. In this phase, if a child initiated a request for a play material to a teacher, the teacher told the child to ask another, nearby child. If necessary, the teacher called the nearby child's attention to the first child and prompted the first child to initiate a request for the material. If necessary, the teacher prompted the second child to confirm, in the way teachers always did, that the first child had asked for the material "right" (using a compound sentence). The teacher made sure that the first child got the material asked for and praised both children for taking their appropriate turns in the interaction. Abrupt and significant changes occurred in terms of to whom compound sentences were directed during free play (from an average of two, to an average of six, compound sentences directed to other children per sample hour). Although compound sentences directed to other children increased markedly during this experimental phase, most of them were themselves generalizations from prior incidental teaching: almost none of those recorded in the language samples were preceded by a teacher prompt (see the bottom graph of Fig. 1, Hart & Risley, 1975).

To see whether there were any changes in children's spontaneous talk to one another, during and after this phase of incidental teaching, we looked at all the sentences recorded at TH as directed to other children, excluding all compound sentences of the topography targeted in intervention ("I want X so I can Y"). Figure 5 shows (top) the average number per 15-min sample of total sentences recorded as directed to teachers (dotted line) and as directed to other children (solid line) each 4-day week across the preschool year at TH (the weeks correspond to those shown in Hart & Risley, 1975, Fig. 1). The middle graph in Figure 5 shows the average number per 15-min sample of Elaborate sentences recorded as directed to teachers (dotted

line) and as directed to other children (solid line). The group averages of total and Elaborate sentences directed to teachers and to other children, for the first and last five Mondays of the TH preschool year are shown in Table 4; these Mondays were the first days of the first 5 and last 5 weeks shown in Figure 5. The vertical lines in the top and middle graphs in Figure 5 demarcate the experimental phases at TH: incidental teaching of labels directed to teachers (weeks 1-9), incidental teaching of compound sentences directed to teachers (weeks 10-19), incidental teaching of compound sentences directed to children (weeks 20-28), and incidental teaching of labels to teachers (weeks 29-32). None of the compound sentences produced during these experimental phases is included in the data of Figure 5, however. The bottom graph in Figure 5 shows for each TH child the average number per 15-min sample of total (open bars) and of Elaborate (solid and hatched bars) sentences recorded as directed to other children during the 2 weeks immediately preceding (A) (solid line and bar) and the two final weeks (B) (dotted line, hatched bar) of incidental teaching of compound sentences directed to children. Individual children are ordered in the bottom graph of Figure 5 by the highest amount of talk to other children; they are numbered as in Table 2. It should be noted that less than 1% of the children's sentences to *either* teachers or other children during weeks 20-28 were recorded as being preceded by any kind of verbal prompt from a teacher.

In Figure 5 it may be seen that incidental teaching of compound sentences directed to other children appeared to produce general increases in the amount of talking to other children and that these increases in talk to other children were accompanied by proportionate increases in use of Elaborate sentences. This effect was general to all the TH children except those who were already talking at high rates to other children. Apparently, in addition to increasing use of compound sentence requests for play materials, incidental teaching of compound sen-

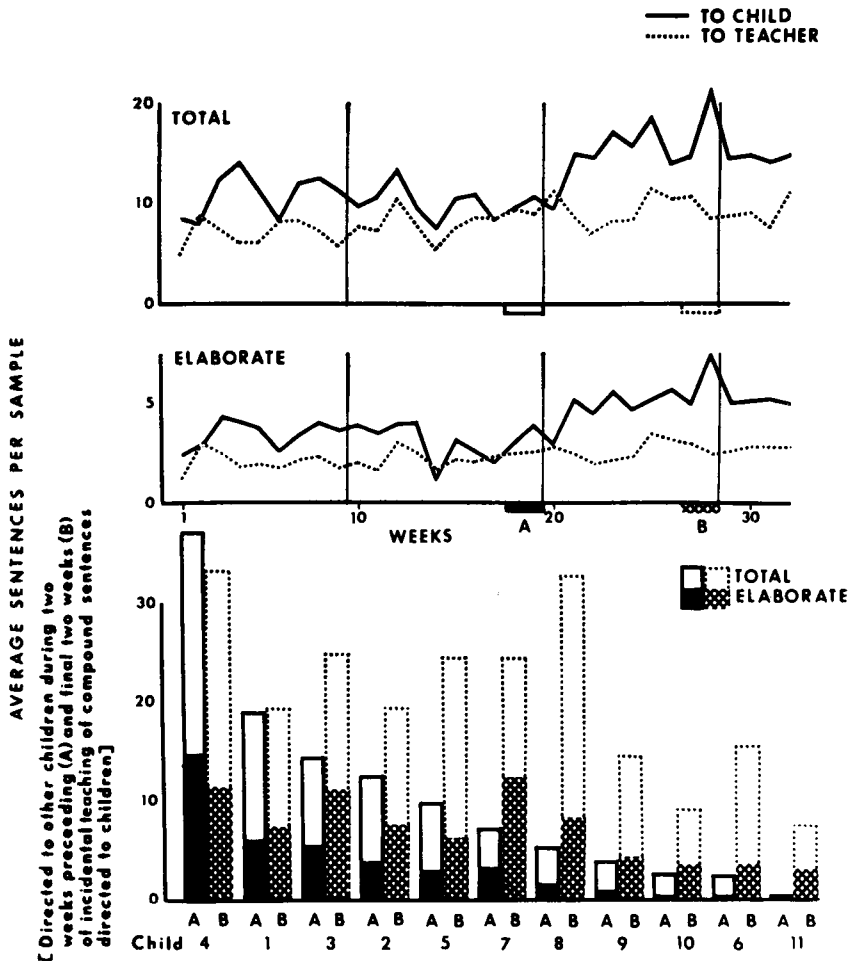


Fig. 5. Average numbers per 15-min sample of total and Elaborate sentences recorded as directed to other children and to teachers at TH. Top: average total sentences directed to teachers (dotted line) and to children (solid line) per 4-day week across the preschool year. Middle: average Elaborate sentences directed to teachers (dotted line) and to children (solid line) per 4-day week across the preschool year. Bottom: average numbers per sample of total (solid line) and Elaborate (solid bar) sentences directed to other children during the 2 weeks immediately preceding intervention (weeks 18-19) (A), and total (dotted line) and Elaborate (hatched bar) sentences directed to other children during the 2 final weeks of intervention (weeks 27-28) (B), for each TH child. Children are numbered as in Table 2. From weeks 20 through 28 incidental teaching of compound sentences was shifted from use to teachers to use to children (see text and Hart & Risley, 1975).

tences directed to children functioned to increase general talk to other children.

In terms of children's use of Elaborate sentences, Figure 5 essentially confirms the correlation between rate of language use and elaboration. The children with the highest rates of using language produced the highest rates of elaborated language throughout the preschool year. For the children with low rates of language use, when rates of use increased, rates of

elaboration increased correspondingly. As with rates of use, increases in elaborated language to other children tended to occur only after incidental teaching was shifted to the initiation of requests for play materials to other children. The correlation between rate of language use and language elaboration appears to hold even when increased use is caused (albeit indirectly) by an experimental intervention: More talking is associated with more elaboration.

GENERAL DISCUSSION

Training language in the child's "natural" environment can apparently have major beneficial effects on the other (extra-training) language the child uses. The Hart and Risley (1975) study demonstrated that a particular topography of language (compound sentences) could be effectively established and generalized in use through incidental teaching in the "natural" preschool environment. That study was concerned entirely with experimental demonstration of the effectiveness of incidental teaching as a training procedure (as were Hart & Risley, 1968, 1974). The present study adds an examination of all the other language used in the context of training in the Hart and Risley (1975) study; it is concerned with language not targeted in training. But the present study shows that in the context of training language in the "natural" environment at TH, major and general increases occurred in many other aspects of language use. Rate of use increased, and with it, elaboration: As the TH children talked more, they used correspondingly more different words and complex sentence structures. At two other comparison preschool settings, HS and KU, rate of language use did not change. Neither in the group of advantaged children at KU nor in the group of disadvantaged children at HS did either use or elaboration change across a preschool year of free play. Only at TH were marked changes seen in rate of use and in corresponding aspects of elaboration. The disadvantaged children at TH, who were initially comparable to their disadvantaged peers at HS in terms of both rate of use and elaboration within use, became much more similar to the advantaged children at KU in terms of both rate and elaboration in language use over the preschool year. The only dimensions of rate targeted throughout the year at TH (Hart & Risley, 1975) were the rates of specific response topographies (names of play materials and compound sentences). Yet language use, verbal behavior as a response class, increased, and increased use was accompanied by

increases in language elaboration. Conducting incidental teaching during free play at TH not only did not restrict or stereotype the language the TH children used, but apparently contributed to the increases in language elaboration.

What is of major importance in the present data, however, is not so much the observed occurrence of talk at the three preschool settings, or even the increases in language use seen at TH. We know from prior research (Hart & Risley, 1968, 1974, 1975) that incidental teaching is one procedure that can be effective in increasing several specific aspects of spontaneous speech, and that its effectiveness is not restricted to any particular language topography. We know that incidental teaching can be used to promote generalization, to direct language initiation and the use of trained language topographies to persons other than those who taught them (Hart & Risley, 1975). What is of significance in the present data is what they indicate about language use as a response class.

Fundamental to language use is contextual control. Like other behaviors, verbal behavior is controlled by its physical and social context. Such is the control of context that a person given a description of a particular setting can predict with considerable accuracy the kinds of language behavior that will occur there (Halliday, 1978). Within the particular setting, however, the immediate stimulus conditions controlling language use will vary not only with shifts in physical location and attention, but also will change in subtle ways with every instance of language use, as new information is introduced and becomes a part of the context. And, as the context of use varies, appropriate language necessarily varies as well. In fact, it may be just this subtle variation, the matching of language content to momentary changes in language context, that is the defining characteristic of "appropriate" language use.

Appropriate language is controlled by the context of use whether the rate of use is high or low, whether an individual talks a lot or a little. But, because, whatever the rate of use,

the topography of language (what is said) is under ongoing stimulus control, appropriate talk in more different conditions means the use of correspondingly more different words and sentence types in order for language to be functional in those more varied stimulus contexts. Thus, as language behavior increases, elaboration also increases, as talking occurs in more different contexts about more different events and things. This relationship between rate of language use and amount of elaboration has been indicated well before now. Roy (1969), for instance, found that rate of talking, alone, was a valid indicator of an individual's proficiency in speaking French, and Nelson (1973, p. 47) found that "verbalizing a lot . . . appears to be . . . positively related to all aspects of learning to talk," at least at age two.

The increases in language elaboration seen in the present study we thus attribute to the increases in language use. The increases in language elaboration were not, then, a result of, or even a generalization from, an experimental manipulation, but reflect characteristics inherent in appropriate language use. As the TH children talked more in more varied contexts, the elaboration of the language they used increased in correspondence with the variation in context, such that the language displayed continued to be contextually appropriate.

The increases in rates of language use, however, we attribute to generalization from incidental teaching. As pointed out in the Introduction, incidental teaching seemed to be a procedure that incorporated many stimulus conditions conducive to generalization. These conditions may be summarized in the observation that the incidental teaching conducted with the TH children was targeted on contextually appropriate language use. If, rather than asking the children to elaborate on why they wanted to use the preschool materials they asked for, the TH teachers had instead asked the children for some contextually irrelevant language behavior (as for recitation of the alphabet), the language response to incidental teaching might well have in-

creased without having the effect of increasing general rates of talking. Hence, the normal relationship between rate and elaboration could not have operated. But in the incidental teaching interactions conducted at TH, the teachers asked children to talk more about contextually related topics, about those things the children had selected from the variable stimulus context of the ongoing preschool program.

When a child selects a topic (something of self-interest) from a variable stimulus context and initiates language about it, the child's behavior is by that very fact under contextual control, and hence, appropriate. This is the defining condition for conducting incidental teaching. In incidental teaching, the child must initiate the interaction, and the teacher must use the child-selected topic as the basis for teaching. The teacher asks the child to say more about whatever topic the child chooses to initiate. Thus, incidental teaching targets those occasions when the child's language is appropriate, under the control of the immediate context, and maintains that contextual control by focusing teaching on the child's topic. Language use thus occurs under the control of aspects of the environment other than the listener, such that as language use increases, stimulus control is maintained, and elaboration also increases.

Further, when a child initiates language use, he or she identifies what is, for him or her at the moment, a pre-potent reinforcer. The power of incidental teaching arises from its capitalization on this moment when a particular reinforcer (a material, activity, conversational topic) happens to be the strongest one in the context of the child because the child has chosen it in preference to everything else currently available in the environment. Incidental teaching is thus tied to the momentary strength of a reinforcer rather than to its nature. It is when the child initiates, and so identifies a momentarily pre-potent reinforcer, that the teacher asks for elaboration relative to the child's selected topic because that is the occasion and the reinforcer most likely to be effective for changing behavior.

When language initiation is strengthened as a general class of behavior, specific instances of the class will increasingly be controlled by transitory and low-level states of deprivation. When a child frequently initiates in low-level states of deprivation, initiation is likely to be reinforced on an intermittent schedule, for adults know that the child will repeat if he or she "really wants something." In these conditions, delay of reinforcement is likely to evoke additional language use, and the contextual control of language (subtle changes in saliency, in what is most important to the child at the moment) is likely to evoke some sort of language variation.

Thus, the increases in rates of talking seen at TH may be attributed to the conditions created by incidental teaching: Differential reinforcement of language initiation when child language was under the stimulus and reinforcement control of aspects of the environment other than the teachers' behaviors. The most important features of incidental teaching, therefore, seem to be its capitalization on those times when the child initiates, when his language is by that fact under appropriate contextual control, and its focus on attempting behavior change relative to the topic the child has chosen as the momentarily pre-potent reinforcer.

For language remediation, the present findings imply the need for settings deliberately arranged for increasing rates of contextually controlled language initiation. Children need to use language at those times when their behavior is appropriately controlled by contextual stimuli other than those presented by adults. One-to-one training may be needed in order to establish a basic communicative repertoire of pointing, asking, identifying, and/or attending to contextual cues for language use. Children may have to be trained to discriminate and respond to the adult cues and prompts that will enable incidental teaching to work. But even while such training is in progress, children need an environment expressly designed and continuously adjusted to produce exploration and initiation, such that the children's behaviors come under the control of

increasingly varied aspects of the environment. Then, as language or other communicative signals begin to accompany exploration, in vivo training can begin. By differentially responding to child initiations and focusing on the contextually controlled topic selected by the child, adults can increase children's rates of appropriate language use in which the normal relationship between rate of language use and language elaboration is maintained.

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