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# Meaningful Differences

in the Everyday Experience of  
Young American Children



by

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split halves of the data to test the findings from each primary regression analysis. In the output from the analyses we ignored statistical significance and considered only the partial correlations indicating the relationships between how much of a quality feature a child hears and its amount and richness in parent speech when each variable (amount and richness) is separated from the effects of the other variable.

- 7 After eliminating any less than ordinary observations (e.g., when the parent was reading a book or when more or fewer than the usual number of family members were present), we averaged the observations in which the parent said the fewest and the most utterances per hour in three periods—when the child was 11–18 months old, 19–27 months old, and 28–36 months old—in order to take into account changes in interaction with the increasing maturity of the child.

## Accomplishments of the 42 Children at Age 3 and Later



When we quantified the quality features of language and interaction we saw consistent differences in the amount of children's experience with language before they were 3 years old. Some children had heard far more language than others and considerably more of the quality features of the language they would need to master. Some children were encouraged far more often to display what they had learned of the language so far and given vastly more affirmative feedback for doing so.

The children, like their families, were remarkably individual; even as infants they were different in personality traits and preferred activities. At age 3 when we ended observation, these differences led them to talk in differing amounts about different things. But by age 3 they were all using language appropriately. They were using clauses and tenses and a varied vocabulary just as their parents did. Nearly all were talking fluently, most more than their parents talked to them.

The observers saw only how normal all the children were. Differences in intelligence and in the complexity of the language they used were made invisible by how competently all the children solved problems and how flexibly they expressed themselves. At 36 months, a difference between an IQ score of 80 and 120 amounts to only 6 months difference in mental age above and below the average. Only people with special training (usually armed with a standardized test) are likely to distinguish a 6-month difference in mental age within the variability of children's behavior.

We needed to measure the children's status at age 3. We had undertaken the observations to study the association between early experience and later language performance, and we had measured the amount and richness of the children's early experience with language and interaction. Now we needed measures of the children's language performance. We knew that the many differences among the children in activity level, emotionality, and family status would continue to influence how the children performed. We chose to focus on accomplishments at age 3 that were likely to be linked to later language performance in school: vocabulary growth, vocabulary use, and IQ score.

### *Measures of Accomplishment*

#### *Vocabulary Growth*

Vocabulary growth reflects a child's rate of language learning in terms of how often the child is adding new words to the vocabulary that make distinctions among old words or that represent new concepts. We measured vocabulary growth as the trajectory of expressive vocabulary change at age 3. David Thissen, a senior statistician,

provided us a statistical description of each child's growth curve, which he derived from a multilevel nonlinear analysis of each child's cumulative vocabulary over the years of observation.<sup>1</sup> The final parameter in the multilevel model of the growth curve projected the trajectory of the curve as the logarithm of the number of words acquired in this early period. Vocabulary growth indicates how steadily a child is learning new words for naming and describing things and actions and their relations.

#### *Vocabulary Use*

Vocabulary use reflects a child's cognitive functioning in daily interaction with experience and predicts the complexity of other people's responses to the child.<sup>2</sup> We measured vocabulary use as the number of different words a child used per hour averaged at 34–36 months of age. The number of different words a child uses indicates simultaneously how much the child is talking, how varied are the topics and contexts of talk, and the size of the vocabulary from which the child can draw. The more sophisticated the ideas the child tries to express, the more the child has probably learned in the past and the more the child needs to call past learnings into present conversation. Vocabulary use indicates how many different things, actions, and relations a child talks about from day to day.

#### *IQ Test Score*

We consider an IQ score at age 3 to provide a valid estimate of the amount a child has learned in 36 months of life rather than an estimate of the child's capacities.<sup>3</sup> The Stanford-Binet Intelligence Scale was given to each child at age 3 within a month after the conclusion of observations. A professional psychologist not associated

with the longitudinal study administered the test. The IQ score indicates how well a child can understand and perform relative to other children of the same age all the various tasks in the Stanford-Binet IQ test.

All the measures of accomplishment at age 3 were highly related. Vocabulary growth (rate of learning words representing new concepts and distinctions between words) was strongly associated with vocabulary use (cognitive functioning in interaction with daily experience) ( $r = .92$ ). Both rate of vocabulary growth and vocabulary use were strongly associated with general accomplishment as estimated by IQ score ( $r_s = .70$  and  $.73$ ). All three measures of accomplishment at age 3 were strongly associated with family SES. The measures specific to language—vocabulary growth and vocabulary use—were most strongly associated with SES ( $r_s = .65$  and  $.63$ ); IQ (general accomplishment) was somewhat less strongly associated with SES ( $r = .54$ ).

#### *The Strength of Relationships Between Experience and Accomplishments*

We were surprised to see just how strongly the differences in the children's experience were related to differences in their accomplishments. Appendix A shows the correlation between each quality feature and each measure of child accomplishment. Some of the quality features could account for half of the differences in children's accomplishments ( $r = .71$ ,  $r$  square =  $.50$ ); such relationships might turn up by chance less than once in every 10,000 calculations involving 42 children ( $p < .0001$ ). The extreme effort and care taken in collecting the data, the large amount of data on each child, and the considerable number and variety of families ob-

served had rewarded us by revealing robust relationships between children's early experience at home and their later accomplishments.

With data this rich in relationships we could afford to be profligate: We note and discuss only features of the children's experience that accounted for more than a quarter of the variance in the children's accomplishments ( $r = .50$ ,  $p < .001$ ). We show the data in Appendix A to invite others to analyze and interpret beyond what we have done here. For the sake of convention, we have marked lesser relationships whose chance occurrence would be less than 1 in 100, but we have considered non-significant any relationships in the  $p < .05$  and  $p > .01$  range most familiar in social science publications.

#### *Child Accomplishments and Quality Features of Language and Interaction*

We saw that when parents talked more, their children got more experience with nearly all the quality features of language and interaction and that more talk did not dilute the richness of quality features in the utterances children heard. We saw robust relationships between three quarters of all the quality features we had measured and one or more of the children's accomplishments at age 3. We needed to identify which were the most important quality features of children's early experience with language and interaction. To do so we compared individual quality features of language and interaction with one another to see which were more strongly related to the children's accomplishments at age 3.

Compared with general parent talkativeness, measured as utterances of all kinds said to a child per hour, the number of words a parent said per hour was more

strongly related to the child's rate of vocabulary growth, vocabulary use at age 3, and general accomplishments measured in IQ score.

Compared with the number of words the parent said per hour, the number of nouns, verbs, modifiers, and functors the parent said per hour was equally strongly related to child accomplishments, but the number of different words of all types the parent said per hour was more strongly related to all of the child's accomplishments at age 3. Compared with the number of words the parent said per hour, the number of sentences the parent said per hour that contained two or more clauses and that were wh-questions or yes/no questions was equally strongly related to child accomplishments, but the number of sentences that contained past-tense verbs or were auxiliary-fronted yes/no questions was more strongly related to all child accomplishments at age 3. All these features of parent language were most strongly related to child vocabulary use and slightly less related to rate of vocabulary growth and general child accomplishments as estimated by Stanford-Binet IQ test score.

We asked whether the richness of some quality features of language and interaction is important over and above the amount of exposure to those features. The richness of words of any kind in parent utterances, of modifiers and functors, of past-tense verbs, of questions of all types, of yes/no questions, auxiliary-fronted yes/no questions, and affirmatives was somewhat more strongly related to rates of vocabulary growth and to children's general accomplishments at age 3 than was the amount of these features the children heard. The richness of nouns and declaratives in parent utterances was more strongly related to rate of vocabulary growth than was the number of nouns and declaratives parents said to their children.

We asked whether any features in parent talk were related to child accomplishments in richness but not amount. We found only three quality features of interaction for which amount was not related to the three measures of child accomplishment while richness was related. All the correlations were negative. The net amount of parent initiations, imperatives, and prohibitions a child heard per hour made no difference to the child's accomplishments at age 3, but the richer the parent's utterances to the child were in initiations, imperatives, and prohibitions, the less rapid was the child's vocabulary growth, the less varied was the child's vocabulary use, and the fewer were the child's general accomplishments as estimated by the Stanford-Binet IQ test. We saw the powerful dampening effects on development when relatively more of the child's interactions began with a parent-initiated imperative ("Don't," "Stop," "Quit") that prohibited what the child was doing.

#### Family SES and Quality

##### Features of Language and Interaction

Because the correlations between the measures of accomplishment and family SES differed in strength, we asked which quality features were more strongly associated with each measure of accomplishment than with family SES. Vocabulary growth at age 3 was strongly correlated with family SES ( $r = .65$ ). But the richness of modifiers and auxiliary-fronted yes/no questions in parent utterances, higher proportions of affirmatives, and lower proportions of imperatives were each more strongly correlated with vocabulary growth than was family SES.

Vocabulary use (the number of different words children used per hour at age 3) was also strongly correlated with family SES ( $r = .63$ ). As might be expected, the

number of different words of all types parents said to their children per hour over the preceding 2 years was much more strongly related to the children's vocabulary use than was their parents' SES. Also more strongly related than family SES to the amount and variety of vocabulary the children were using at age 3 were the absolute number per hour of modifiers, past-tense verbs, and affirmatives the children had heard, the richness of modifiers and past-tense verbs, the scarcity of imperatives, and the lower proportion of initiations in their parents' utterances.

As expected, the children's performance on the variety of tasks contained in the Stanford-Binet IQ test battery, were robustly associated with their family SES ( $r = .54$ ). But many of the quality features of the language and interaction they had experienced were even more robustly associated with the children's general accomplishments as measured by the IQ test. The richness of nouns, modifiers, and past-tense verbs in their parents' utterances; their parents' high propensity to ask yes/no questions, especially auxiliary-fronted yes/no questions; and their parents' low propensity to initiate and use imperatives and prohibitions were more strongly predictive of the children's performance on the Stanford-Binet IQ test battery than was family SES.

### *Categories of Significant Family Experience*

We examined the quality features of language and interaction individually to see which were more strongly related to children's accomplishments than to their family's social and economic status. Those quality features that were more strongly related to children's accomplishments than were the advantages conferred by SES we then as-

sembled into logical combinations that would characterize categories of significant family experience with language and interaction and correspond to our impressions of the parent behaviors that added quality to everyday socializing with children (see Table 2). The categories of significant family experience were exemplified in five derived variables: Language Diversity, Feedback Tone, Symbolic Emphasis, Guidance Style, and Responsiveness (see Figures 13-17).

Table 2 Links between impressions of parent behaviors and quantifications

Impressions of parent behaviors described in examples	Sets of quality features coded in data variables	Categories of significant family experience exemplified in derived variables
They just talked	Vocabulary: all words, all different words (nouns, modifiers, verbs, functors)	Language Diversity: sum of different nouns plus different modifiers used per hour
They tried to be nice	Valence: approvals, repetitions, prohibitions	Feedback Tone: affirmatives (approval plus repetition) divided by affirmatives plus prohibitions per hour
They told children about things	Sentences: clauses, verb tenses (past, present, future)	Symbolic Emphasis: sum of nouns, modifiers, past-tense verbs per hour divided by utterances per hour
They gave children choices	Discourse functions: declaratives, imperatives, interrogatives (wh-questions, yes/no questions, auxiliary-fronted yes/no questions)	Guidance Style: Auxiliary-fronted yes/no questions divided by auxiliary-fronted yes/no questions plus imperatives per hour
They listened	Adjacency conditions: initiations, responses, floorholding	Responsiveness: responses minus initiations divided by responses per hour

Language Diversity

Language Diversity denotes the amount of a child's experience with language. The more often a child hears words used in association with a variety of events and other words, the more varied and refined are the meanings of words for the child. The variety of experiences that a parent talks about to the child is reflected in the number of different words the parent uses. We used the sum of the number of different nouns and different modifiers a parent said per hour to exemplify Language Diversity. These two quality features were more strongly related to all the measures of child accomplishments than was the sum of all different words; these features reflect particularly well the relationship between talking in more varied contexts and naming and describing a greater variety of objects and their attributes.

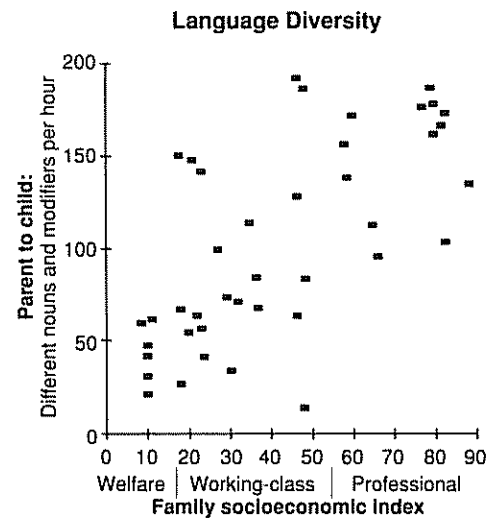


Figure 13. Each square is the characteristic Language Diversity of an individual parent's talk. (See Appendix B for a detailed explanation of this figure.)

Feedback Tone

Feedback Tone denotes the prevailing affect of parent-child interactions. Parent feedback may encourage a child to attend to and participate in language learning or it may discourage the child from working with words. To exemplify Feedback Tone we used the proportion of feedback to the child that was positive. We divided the amount of positive feedback (parent repetitions, extensions, expansions of child utterances, confirmations, praise, approval) per hour by the amount of all feedback, positive plus negative (imperatives to warn or prohibit, disconfirmations, criticisms, disparagements), per hour in order to combine these contrasting characteristics in a single variable descriptive of a child's typical interactions.

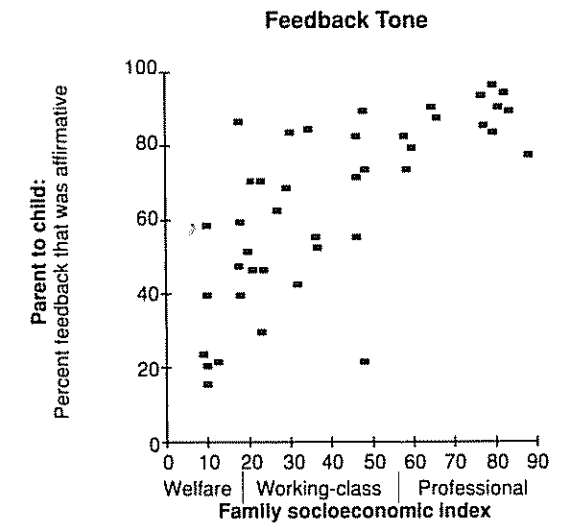


Figure 14. Each square is the Feedback Tone characteristic of an individual parent's interactions. (See Appendix B for a detailed explanation of this figure.)

Symbolic Emphasis

Symbolic Emphasis denotes the relative amount of a child's experience with language that refers to relations between things and events. In the aspects of experience parents choose to talk about, they casually emphasize what the culture expects children to notice, name, recall, and relate to other words and experiences in speaking and thinking. To exemplify Symbolic Emphasis we used the richness of nouns, modifiers, and past-tense verbs in parent utterances per hour. We divided the sum of the nouns, modifiers, and past-tense verbs a child heard per hour by the number of utterances the child heard per hour to combine into one variable the three quality features of language individually most strongly associated with child accomplishments at 3.

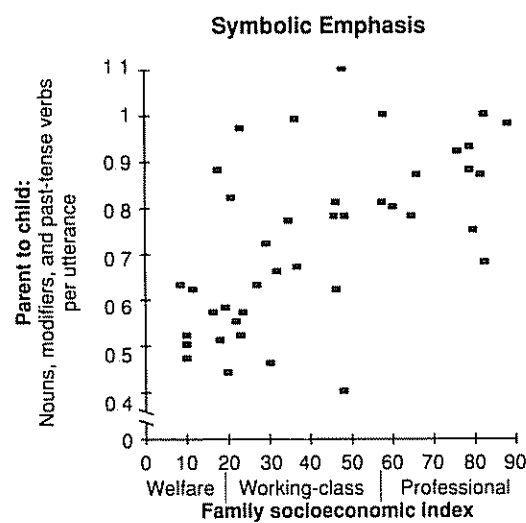


Figure 15 Each square is the Symbolic Emphasis characteristic of an individual parent's talk. (See Appendix B for a detailed explanation of this figure.)

Guidance Style

Guidance Style denotes the relative amount of prompting a child experiences: how often the child is asked rather than told what to do. Parent prompts suggest a more appropriate behavior, or a more correct label or sentence structure and ask the child to choose the more mature form; such prompts imply the parent's confidence that the child is motivated to improve and does not need to be ordered to do so. To exemplify Guidance Style we used the proportion of guidance that took the form of auxiliary-fronted yes/no questions ("Can you..." "Do you..." "Shall we..." "Is it..." "Are they..."). We divided the number per hour of auxiliary-fronted yes/no questions by the number of auxiliary-fronted yes/no questions plus the number of imperatives per hour in order to combine these contrasting quality features in a single characteristic descriptive of a child's typical experience in receiving directives.

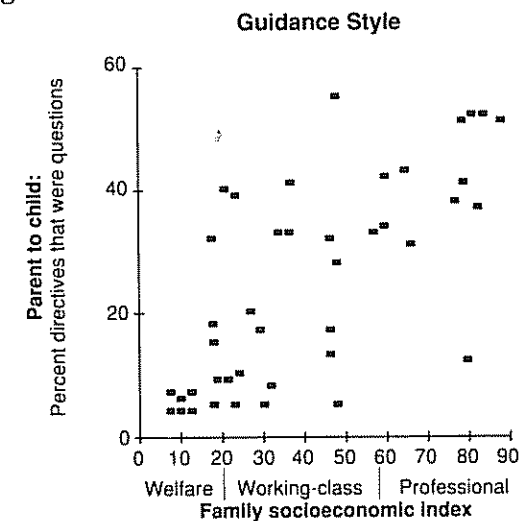


Figure 16 Each square is the characteristic Guidance Style of an individual parent's interactions. (See Appendix B for a detailed explanation of this figure.)



### Responsiveness

Responsiveness denotes the relative amount of a child's experience with controlling the course of interaction. Parent responses reflect a parent's interest in supporting and encouraging a child's practice and the parent's appreciation of, and adaptation to, the child's current skill level and choice of topic. Responsiveness is at the core of teaching at the zone of proximal development. To exemplify Responsiveness, we used the proportion of all parent responses that were not preceded by parent initiations. From the number of all parent responses to the child per hour we subtracted the number of parent initiations to the child per hour and divided the result by all parent responses.

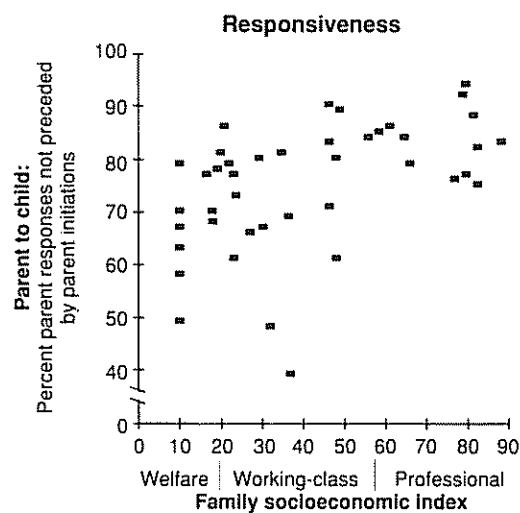


Figure 17 Each square is the characteristic Responsiveness of an individual parent's interactions. (See Appendix B for a detailed explanation of this figure.)

### Amount of Significant Family Experience and Accomplishments at Age 3

All five variables exemplifying the categories of significant family experience, like the measures of the quality features of language and interaction from which they were derived, were highly related to one another, to family SES, and to all child accomplishments at age 3. Data for each of the parents and children are listed in Table 3<sup>4</sup> and shown graphically in Figures 13-17. We used multiple regression analyses to see which derived variables were related to child accomplishments beyond their common correlations.

We found that Language Diversity and Feedback Tone were somewhat independent of one another and differently related to child accomplishments at age 3. Language Diversity was more strongly related to child vocabulary use at age 3. Feedback Tone was more strongly related to rate of vocabulary growth and general accomplishments estimated by IQ score. Language Diversity and Feedback Tone may be seen as characterizing the fundamental quality of a child's everyday experience with language and interaction. The greater the amount of Language Diversity in parent talk, the more opportunities the child has for observational learning about how words refer and how they are used in relation to other words. The more positive the affect during interactions the more motivated the child is to explore new topics, to try out tentative relationships, to listen and practice, to add words to those already accumulated, and to notice the facts and relationships that IQ testers ask about.

Symbolic Emphasis, Guidance Style, and Responsiveness, when compared with each other, seemed to identify characteristics of language and interaction that

Table 3. Categories of significant family experience before age 3, children's accomplishments at age 3, and performance at age 9

Rank by SEI	Experience before age 3							Children at age 3				Scores at age 9-10	
	Language diversity	Feedback tone	Symbolic emphasis	Guidance style	Responsiveness	Vocabulary growth	Vocabulary use	IQ	PPVT-R	TOLD			
1	134	.77	.98	.51	.83	7.40	269	139					
2	172	.94	1.00	.52	.82	7.67	375	126					
3	103	.89	.68	.37	.75	7.35	292	110	112	56			
4	165	.90	.87	.52	.88	7.33	280	105	116	73			
5	161	.96	.88	.51	.77	7.08	247	113	134	70			
6	177	.83	.75	.12	.94	7.52	401	115	113	65			
7	186	.85	.93	.41	.92	7.06	274	122					
8	175	.93	.92	.38	.76	7.00	204	110					
9	95	.87	.87	.31	.79	7.58	368	120	114	74			
10	112	.90	.78	.43	.84	7.59	270	115					
11	171	.79	.80	.42	.86	7.42	285	108					
12	138	.73	.81	.34	.85	7.21	281	127	94	65			
13	155	.82	1.00	.33	.84	7.49	317	108	102	65			
14	185	.89	1.10	.55	.89	7.67	368	149	116	76			
15	13	.21	.40	.05	.61	6.75	182	98	95	44			
16	82	.73	.78	.28	.80	7.42	267	122	122	71			
17	191	.71	.78	.13	.90	7.25	293	93	94	65			
18	62	.55	.62	.17	.71	7.08	212	120	95	62			
19	127	.82	.81	.32	.83	7.42	250	113	112	63			
20	66	.52	.67	.41	.39	7.47	246	105	116	64			
21	83	.55	.99	.33	.69	7.04	256	129	121	69			
22	113	.84	.77	.33	.81	7.03	238	98	102	55			
23	70	.42	.66	.08	.48	6.61	179	96	79	48			
24	32	.83	.46	.05	.67	6.78	107	108	86	55			
25	72	.68	.72	.17	.80	6.97	200	90					
26	98	.62	.63	.20	.66	6.15	89	62	105	54			
27	40	.46	.57	.10	.73	6.71	132	98					

28	56	.29	.52	.05	.61	6.31	126	93	80	48
29	141	.70	.97	.39	.77	7.21	241	139		
30	62	.46	.55	.09	.79	6.41	107	103	108	47
31	147	.70	.82	.40	.86	7.32	318	122	127	77
32	53	.51	.44	.09	.81	6.90	198	96	86	66
33	25	.39	.51	.05	.68	7.03	249	109	105	66
34	66	.59	.58	.15	.78	7.01	210	113	96	60
35	66	.86	.57	.18	.70	6.93	189	93		
36	149	.47	.88	.32	.77	7.00	311	113	105	59
37	60	.58	.50	.07	.79	6.93	221	103	79	40
38	20	.21	.52	.07	.63	6.52	131	75		
39	29	.39	.62	.04	.49	6.71	139	74		
40	46	.20	.52	.04	.67	6.65	159	74		
41	40	.15	.47	.04	.70	6.64	123	84	83	43
42	58	.23	.63	.06	.58	6.56	120	66	76	48
Average:	100	.64	.72	.25	.75	7.05	232	106	103	60
r with:										
SES	.68	.73	.62	.71	.50	.65	.63	.54	.	.
Language diversity	—	.73	.84	.76	.70	.64	.73	.53	.	.59
Feedback tone	—	—	.67	.75	.64	.71	.64	.58	.59	.64
Symbolic emphasis	—	—	—	.76	.	.69	.72	.67	.64	.70
Guidance style	—	—	—	—	.	.73	.67	.68	.77	.71
Responsiveness	—	—	—	—	—	.55	.62	.52	ns	.
r with:										
Vocabulary growth	—	—	—	—	—	—	.92	.73	.58	.74
Vocabulary use	—	—	—	—	—	—	—	.70	.57	.72
Stanford-Binet IQ	—	—	—	—	—	—	—	—	.	.64

Note: Numbers,  $p < .001$ ; \*,  $p < .001 < .01$ ; ns, not significant. For an explanation of this table, see this chapter, endnote 4. Child 36 was an outlier who was not included in the analyses of vocabulary growth; see this chapter, endnote 4.

in somewhat different ways refined and added nuances to the fundamental amount and tone of children's experience. Symbolic Emphasis was more strongly related to vocabulary use, whereas Guidance Style was more strongly related to vocabulary growth and IQ score. Responsiveness was independently related to all three child accomplishments.

The analyses suggested that parents who provide more of the fundamentals, larger amounts of diverse language experience and more encouragement to learn, tend also to add the nuances. They tend to be responsive: They listen and prompt relative to what the child has to say more often than they try to interest the child in adult concerns. They tend to encourage autonomy: They ask for compliance more often than they demand it. They tend to make language important: They name and explain everything whether or not the child cares or understands (yet).

The socioeconomic status of the children's families could account for 42% of the variance in the children's rates of vocabulary growth ( $r = .65$ ), 40% of the variance in their vocabulary use ( $r = .63$ ), and 29% of the variance in their IQ test scores ( $r = .54$ ) when they were 3 years old.

When we entered as "Parenting" all five derived variables in a multiple regression analysis with each of the child accomplishments at 3, the five categories of significant family experience with language and interaction could together account for 61% of the variance in the rates of vocabulary growth and in the vocabulary use of the 42 children ( $r = .78$ ), and for 59% of the variance in their general accomplishments as estimated by the Stanford-Binet IQ score ( $r = .77$ ). (See Figure 18.)

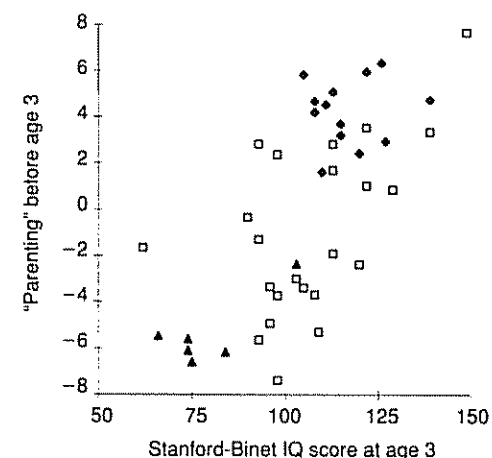


Figure 18. Parenting is the combination of Language Diversity, Feedback Tone, Symbolic Emphasis, Guidance Style, and Responsiveness. Each square is an individual parent's parenting before the child was age 3 plotted against the child's IQ test score at age 3. (See Appendix B for a detailed explanation of this figure.)

We had found what we were looking for in the longitudinal study: We saw that what parents said and did with their children in the first 3 years of language learning had an enormous impact on how much language their children learned and used. But the correlations were not perfect; clearly, factors we had not included in our analyses were influencing the children's accomplishments at 3. We wondered whether the differences we saw at 3 would be washed out, like the effects of a preschool intervention, as the children's experience broadened to a wider community of competent speakers. Like the parents we observed, we wondered how much difference children's early experiences would actually make. Could we, or parents, predict how a child would

do in school from what the parent was doing when the child was 2 years old?

#### *Test Performance in Third Grade and Accomplishments at Age 3*

Fortune provided us with Dale Walker, who recruited 29 of the 42 families to participate in a study of their children's school performance. When the children were in the third grade, Dr. Walker provided us with their scores on a battery of standardized tests.<sup>5</sup> We had a chance to see the extent to which the children's language accomplishments at 3, and their experience with language and interaction at the age of 1-2 years, would predict their academic performance at age 9-10 years, after 6-7 years of intervening experience.

We were awestruck at how well our measures of accomplishments at 3 predicted measures of language skill at 9-10 (see Table 3). From our preschool data we had been confident that rate of vocabulary growth would predict later performance in school; we saw that it does. For the 29 children observed when they were 1-2 years old, rate of vocabulary growth at age 3 was strongly associated with scores at age 9-10 on both the Peabody Picture Vocabulary Test-Revised (PPVT-R) of receptive vocabulary ( $r = .58$ ) and the Test of Language Development-2: Intermediate (TOLD) ( $r = .74$ ) and its subtests (listening, speaking, semantics, syntax).

Vocabulary use at 3 was equally predictive of measures of language skill at age 9-10. Vocabulary use at 3 was strongly associated with score on both the PPVT-R ( $r = .57$ ) and the TOLD ( $r = .72$ ). Vocabulary use at 3 was also strongly associated with reading comprehension score on the Comprehensive Test of Basic Skills

(CTBS/U) ( $r = .56$ ). General competence as estimated by Stanford-Binet IQ test score at 3 less strongly predicted scores on both the PPVT-R and the TOLD ( $r = .64$ ), presumably because only part of the Stanford-Binet IQ test is related to language.

We had speculated, however, that rates of vocabulary growth might be related rather specifically to language skills. We saw no association between rate of vocabulary growth and the children's third-grade scores in the academic skill areas of reading, writing, spelling, and arithmetic or with scores on the Otis-Lennon School Ability Test, 6th edition (OLSAT) of verbal and nonverbal reasoning.<sup>6</sup> Nor was any association seen between either vocabulary use or IQ test score at 3 and performance in these other academic skill areas at 9-10.

#### *Early Family Experience and Test Performance in Third Grade*

Given the predictability of child accomplishments at age 9-10 from accomplishments at age 3, we asked whether we could also predict the children's accomplishments at 9-10 from what their parents had been doing 6 or 7 years earlier when the children were 1-2 years old. We found that our derived variables predicted scores on the TOLD almost as well as did child accomplishments at 3: Language Diversity ( $r = .59$ ), Feedback Tone ( $r = .64$ ), Symbolic Emphasis ( $r = .70$ ), and Guidance Style ( $r = .71$ ) were strongly associated with scores on the TOLD. Feedback Tone ( $r = .59$ ), Symbolic Emphasis ( $r = .64$ ), and Guidance Style ( $r = .77$ ) were better predictors of scores on the PPVT-R than were child accomplishments at 3. Responsiveness was weakly associated with scores on the TOLD but not with scores on the PPVT-R,

and there were no strong associations between the derived variables and performance in other academic skill areas.

As a strong test of the data and our efforts to summarize what we had observed these 29 parents actually doing with their children, we compared the derived variables to family SES to see which could account for more of the variance in children's performance on third-grade tests of language skill 6 years later. Family SES could account for 30% of the variance in the children's PPVT-R scores ( $r = .55$ ) and 24% of the variance in their TOLD scores ( $r = .49$ ) in the third grade. A multiple regression analysis showed that the five derived variables exemplifying categories of significant family experience before age 3 could together account for 61% of the variance in the children's scores on both the PPVT-R and the TOLD ( $r_s = .78$ ). The link between the parents' income, education, and social status and their children's academic test performance had declined by the third grade. However, the link between what the parents were doing with their children before the children were 3 years old remained as strong as ever over the intervening 6 years ( $p < .001$ ).

### *Vocabulary Growth Revisited*

We returned to our 20-year-old questions, those that had brought us to the longitudinal observations, and we looked again at the data from the Turner House children and the professors' children. We compared the extremes we had observed in the preschool to the extremes among the 42 families—the welfare children (all of whom would have been eligible for the Turner House Preschool program when it existed) and the children in professional

families, even though it meant comparing data from different sources, years, and child ages.

The data from the professors' children and the Turner House children were recorded during preschool free play rather than during interactions at home. The children were 5 years old at the end of the preschool year and were all competent speakers rather than just beginning to accumulate vocabulary. We were comparing children in families separated by 15 years of social and economic changes in society, a fact brought home to us when we recruited in the longitudinal study a parent whom we had taught in the Turner House Preschool when she was 4.

Nevertheless, test scores from the two groups were surprisingly comparable. The 12 professors' children were tested in 1967 at an average age of 5:2; their average score on the PPVT was 117. The average Stanford-Binet IQ score of the 13 children observed in professional families was 117 at age 3. The 11 Turner House children were tested in 1967 at an average age of 4:11; their average score on the PPVT was 75. The average Stanford-Binet IQ score at age 3 of the 6 welfare children observed at home was 79.

In 1967 we did not have the sophisticated statistical model of vocabulary growth developed by Dr. Thissen (see this chapter, endnote 1). In his multilevel nonlinear model, vocabulary growth began at the first recorded word and increased with each monthly observation independent of the amount of talking the children did. Our vocabulary growth curves in 1967 were cumulative type/token curves<sup>7</sup> (see Figure 1) that described the rate the Turner House and professors' children were using words from previously learned vocabulary. An estimate

of vocabulary resources is gained from such curves only after 10,000 or more spoken words have been recorded.

We derived an average growth slope from the data we had used to construct the cumulative type/token curves of the Turner House and the professors' children. Between 10,000 and 15,000 spoken words, the average growth slope for the Turner House children was .027 or 3 new words added to the dictionary in use per 100 words spoken. The average growth slope for the professors' children was .060 or 6 new words added to the dictionary in use per 100 words spoken. The vocabularies in use by the professors' children were growing at twice the rate of the vocabularies in use by the Turner House children.

For the children in welfare and professional families in the longitudinal study, we compared the number of new words added to the recorded vocabulary between the ages of 30–36 months, when all the children were regularly using sentences and clauses appropriately. The welfare children added an average of 168 words in the 6 months from age 30–36 months; the children in professional families added an average of 350 or twice as many. The welfare children were adding fewer numbers of words to vocabularies already smaller: At 30 months, the welfare children had an average recorded vocabulary of 357 words, less than half as many as the 766 words in the average vocabulary of the children in professional families.

Like the children in the Turner House Preschool, the welfare children at age 3 not only had smaller vocabularies than did children of the same age in professional families, but they were also adding words more slowly (compare Figures 1 and 2). Projecting the developmental trajectory of the welfare children's vocabulary growth curves, we could see an ever-widening gap similar to the

one we saw between the Turner House children and the professors' children in 1967. And the children's PPVT-R scores in third grade showed us how unlikely the gap was to narrow with increasing years of experience.

### *Everyday Parenting Revisited*

We now had answers to our 20-year-old questions. We had observed, recorded, and analyzed more than 1,300 hours of casual interactions between parents and their language-learning children. We had disassembled these interactions into several dozen molecular features that could be reliably coded and counted. We had examined the correlations between the quantities of each of those features and several outcome measures relating to children's language accomplishments. Based on those correlations, our understanding of the literature, and the impressions concerning stable patterns of parenting we had absorbed from thousands of hours of observing different families similarly raising children, we reassembled the quality features into five derived variables that exemplified the categories of significant family experience we had seen occurring in all family homes.

We saw that each of the five derived variables was more strongly related to children's accomplishments than were most of the molecular variables, the particular quality features of language and interaction, of which they were composed. Each of the five variables derived to exemplify categories of significant family experiences was strongly related to family SES: We saw the immense gulf between the amount and richness of daily experience separating children's lives at the extremes of advantage.

The relationship between each of the five derived variables and family SES has been shown in Figures

13-17. The strong relationship between the amount of each derived variable and family SES is apparent: Overall, the higher the SES, the greater the amount of each derived variable. At the extremes, we see nearly all the advantaged children receiving from their college-educated professional parents large amounts of each derived variable and nearly all the children being raised in welfare homes receiving small amounts of each variable from their isolated parents. In the middle we see the marked variety of the American working class: Some families are high and some are low in terms of the amounts of the categories of significant family experience they provide their children, and there is no relationship to the status of their jobs.

We turned to the other question that had led us to the longitudinal study, which was our need to know about children's early experience not just at the extremes in advantage but across the full spectrum of American families. If the variables we derived from our observations of children at home were important characteristics of family experience and not just epiphenomenal correlates of other "real" variables associated with SES, we should see the effects of these variables relative to the accomplishments of the 23 children in the working-class families where the correlations between the derived variables and SES were nearly zero.

The Language Diversity of the talk that the 23 working-class parents addressed to their children was not significantly related to their SES or to the children's IQ scores, but it was somewhat related to their children's vocabulary growth and was strongly related to their children's vocabulary use. Feedback Tone in the 23 working-class families was not significantly related to their SES, to the children's IQ scores, or to their vocabu-

lary use and was only somewhat related to their children's vocabulary growth. Symbolic Emphasis in the speech of the 23 working-class parents was not significantly related to their SES and was somewhat related to their children's vocabulary growth, but was strongly related to their children's vocabulary use and IQ test scores. Guidance Style in the 23 working-class families was not related to their SES but was strongly related to the vocabulary growth, vocabulary use, and IQ test scores of their children. The Responsiveness of the working-class parents was not related to either SES or to any of the children's accomplishments at 3.

Overall the socioeconomic status of the 23 working-class families could not account for a significant amount of their children's accomplishments at age 3 or for the test scores of the 19 working-class children at age 9 in the third grade. But parenting, all five derived variables when entered in a multiple regression analysis could together account for over 60% of the variance in the measures of accomplishment at age 3 (vocabulary growth, vocabulary use, and Stanford-Binet IQ score) and in the PPVT-R and TOLD scores at age 9-10. These relationships are summarized in Table 4.

The five derived variables, which so uniformly marked the SES extremes among the families we observed, also robustly predicted the accomplishments of the working-class children, and race made no contribution to the prediction.<sup>8</sup> We conclude that these variables are not simply marker variables denoting social class or subculture but are powerful characteristics of everyday parenting that cause important outcomes in children (see Figure 18). We had succeeded in capturing in the data the categories of significant family experience we had seen blended in the everyday parenting we observed in all 42 families. Some

Table 4 Correlations between children's accomplishments and family SES and parenting

	Vocabulary growth at age 3		Vocabulary use at age 3		IQ test score at age 3		PPVT score at age 9		TOLD score at age 9	
	All SES <sup>a</sup>	Working class	All SES	Working class	All SES	Working class	All SES	Working class	All SES	Working class
n <sup>b</sup> =	41	22	42	23	42	23	29	19	29	19
SES	.65**	.46	.63**	.31	.54**	.24	.55*	.19	.49*	.15
Parenting <sup>c</sup>	.78**	.74**	.78**	.80**	.77**	.76**	.78**	.82**	.78**	.75**

\* $p < .01$  \*\* $p < .001$ <sup>a</sup>All SES = professional, welfare, and working class<sup>b</sup>See text for explanation of differences in the number of children included in each analysis. Data for individual children and families are shown in Table 3. The outlier, Child 36, was not included in the analyses of vocabulary growth; see this chapter, endnote 4.<sup>c</sup>Parenting = all five categories of significant family experience combined

categories were more characteristic of parenting in some SES groups and less characteristic of parenting in others, but the amount of whatever combination was characteristic of everyday parenting in the individual family was predictive of the accomplishments of the child.

From the tremendous effort we had put into the years of observing ordinary families and coding the resulting volume of data we learned about what is happening to children at home and the experiences that influence their developmental trajectories. But we also learned that the problem of intervening in the lives of children from families in poverty is considerably more complex than we thought, simply because the first 3 years of experience are so much more important than we thought.

## Endnotes

1. Dr. David Thissen, director of the Psychometric Laboratory at the University of North Carolina, is an expert in the statistical measurement of growth curves (see Thissen & Bock, 1990). He used the month-by-month increments in the recorded vocabulary for each of the children we observed to fit a nonlinear curve to each child's cumulative vocabulary growth and from these derived a "normal" curve of expressive vocabulary growth.

His multilevel model of vocabulary growth has three parameters:

a) a "slope" parameter reflecting the rate-of-vocabulary-acquisition at the maximum rate of acquisition. The age at this maximum rate varies for individual children, but those with large values on the "slope" parameter are acquiring words faster.

b) a "location" parameter reflecting the age at which a maximum rate of vocabulary growth is achieved (after some acceleration, before deceleration). (The average age of the 42 children at this "location" was 29 months, range 23-32 months.)

c) an "asymptote" parameter reflecting where the rate of growth is going, on the scale of the logarithm of the number of words. The "asymptote" does not imply an end or slowing of word learning but rather the number of words acquired in this early phase.

Further work with the statistical aspects of the model was reported by McFarlane (1994).

2. The vocabulary data from the children were coded and computer processed exactly as were the data from the parents. An individual dictionary was compiled for each child, and it was checked at each observation in order to add new entries and count the different words appearing in the child's utterances. The reliability of child words was assessed exactly as the reliability of parent words (see Chapter 6, endnote 3) when each observer listened inde-



pendently to the randomly chosen tapes on each child she had not observed and marked on the transcript each word she agreed she heard on the tape. As in that assessment, the observer marked disagreements on individual words, on utterance segmentation, and added omitted words to total disagreements. Agreements were divided by the totals reported by computer processing of the observation. Average agreement was .95 (range .79–1.00 per child).

Menard and Santerre (1979) reported a large-scale study of adults in Canada who were asked to speak onto audiotape; they found that speech richer in vocabulary, especially nouns and modifiers, marked individuals with more education, higher-salaried jobs, and more affluent areas of residence.

3. Each child was administered the Stanford-Binet IQ test (Terman & Merrill, 1960) within a month after the final observation at age 3. A professional psychologist not associated with the longitudinal research gave each child the test.

Weinberg (1989) summarized the years of study and argument concerning what intelligence is, whether it is, how it might develop, and what IQ tests seem to be measuring.

4. Table 3 shows for each of the 42 children the five categories of significant family experience before age 3, accomplishments at age 3, and performance at age 9–10. Rank is the same as in Appendix A. Correlation coefficients are shown only if they were significant at the .001 level; asterisks indicate correlations with significant levels between .001 and .01. At age 3 the 42 children were observed at home; at age 9–10, 29 of the 42 children were tested in school (see this chapter, endnote 5).

The categories of significant family experience before 3 are the derived variables, Language Diversity, Feedback Tone, Symbolic Emphasis, Guidance Style, and Responsiveness. Language Diversity indicates the parent's propensity to talk in varied contexts, as exemplified by the average total number of different nouns and modifiers the parent used. Feedback Tone indicates how proportionately

affirmative the parent's feedback was to the child, as exemplified by the average amount of affirmative feedback divided by all feedback, affirmative plus prohibitions. Symbolic Emphasis indicates the importance of precise language in family interactions, as exemplified by the average number of nouns, modifiers, and past-tense verbs the parent used per utterance. Guidance Style indicates the parent's propensity to ask the child rather than to demand behavior, as exemplified by the proportion of auxiliary-fronted yes/no questions ("Can you . . .") in total requests (auxiliary-fronted yes/no questions plus imperatives). Responsiveness indicates the relative importance during interaction of the child's behavior, as exemplified by the average proportion of all parent responses that were not preceded by parent initiations (parent responses minus parent initiations divided by parent responses).

Child accomplishments at 3 were vocabulary growth, which is the projection of the vocabulary growth curve in Thissen's multilevel model (see this chapter, endnote 1); vocabulary use, which is the average number of different words the child used in the last three (34–36 months of age) observations (see this chapter, endnote 2); and Stanford-Binet IQ scores (see this chapter, endnote 3).

In the regression analyses in which vocabulary growth was the dependent variable, the data of only 41 of the 42 children were used. The average age at which the children began to talk was 11 months. The child ranked 36 waited until the age of 24 months before beginning to talk; the parameters of this child's vocabulary growth curve are multivariate outliers. Therefore, so that the regression analysis would better represent the group as a whole, this child's vocabulary growth curve was set aside for separate consideration.

Children's scores at ages 9–10 are those of the 29 children tested in third grade (see this chapter, endnote 5). PPVT-R is the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981). TOLD is the Test of Language De-

velopment-2: Intermediate (Hammill & Newcomer, 1988).

5. Dale Walker of the University of Kansas conducted the follow-up study as part of the research program of the Juniper Gardens Children's Project in Kansas City, Kansas, sponsored by the University of Kansas Schiefelbusch Institute for Life Span Studies. See Walker, Greenwood, Hart, and Carta (1994) for a description of the methods and results of the study. Children were individually tested in the spring and fall of each year from kindergarten to third grade. When tested in the spring of third grade some children were 9 years old and some were 10. The tests given were: Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981), a test of receptive one-word vocabulary in response to pictures; Test of Language Development-2: Intermediate (TOLD) (Hammill & Newcomer, 1988), a test of spoken language consisting of sentence combining, how words are alike, word ordering, word categories, grammatical comprehension, and malapropisms; Wide Range Achievement Test-Revised (WRAT-R) (Jastak & Wilkinson, 1984), a test used to assess spelling achievement; The Comprehensive Test of Basic Skills (CTBS/U 3rd ed.) (CTBS, 1987), a test used to assess reading, writing, and arithmetic; and Otis-Lennon School Ability Test 6th edition (OLSAT) (Otis & Lennon, 1989), a test designed to assess verbal comprehension, verbal reasoning, and pictorial, figural, and quantitative reasoning.

Dr. Walker obtained permission for testing from the schools the children attended and from the children's parents. Of the 42 children, 29 were in the follow-up group tested in third grade. Three of the families had moved out of the city, and 3 of the children in the welfare families at age 3 could not be located in the city schools. Six of the professional and one of the working-class parents declined by saying they did not want their children to feel they were being singled out from their classmates; unlike many of the parents who gave permission, these parents ex-

pressed little interest in additional documentation that their children were achieving academically.

The subset of children tested in school was more homogeneous and more middle class than the group of 42 families. The 29 children included only half of the children observed in the professional and welfare families but 83% of the children observed in working-class families. For this subset of 29 children, though, we saw the same strong relationships between the measures of accomplishment at age 3. Vocabulary growth rate was strongly associated with vocabulary use ( $r = .92$ ), and both were strongly associated with general accomplishments as estimated by Stanford-Binet IQ score ( $r_s = .69$  and  $.72$ ). The association of vocabulary growth and vocabulary use with SES was somewhat less strong ( $r_s = .60$  and  $.59$ ), and IQ score was not associated with family SES.

6. We saw no association between children's accomplishments at age 3 (rate of vocabulary growth, vocabulary use, IQ score) and achievement in third grade in academic skill areas other than those specifically related to language. Whether there would be an association later in elementary school or in high school when so much of the curriculum begins to depend on vocabulary resources (see Becker, 1977), we do not yet know.
7. We discussed the comparison of the Turner House children's growth curves and issues related to cumulative vocabulary growth and its measurement in Hart and Risley (1981).
8. Among the 23 working-class families, 10 were African American and 13 were white. Multiple regression analyses showed that race made no contribution to any of the child accomplishments over and above parenting. A separate regression analysis was run for vocabulary growth, vocabulary use, and IQ; in each we controlled for parenting by entering the sum of the z scores for the five derived variables first and then entering race. In each analysis the change in  $r$  square was less than or equal to .01 and nonsignificant.