

The Early Catastrophe The 30 Million Word Gap by Age 3

Betty Hart and Todd R. Risley

During the 1960's War on Poverty, we were among the many researchers, psychologists, and educators who brought our knowledge of child development to the front line in an optimistic effort to intervene early to forestall the terrible effects that poverty was having on some children's academic growth. We were also among the many who saw that our results, however promising at the start, washed out fairly early and fairly completely as children aged.

In one planned intervention in Kansas City, Kans., we used our experience with clinical language intervention to design a half-day program for the Turner House Preschool, located in the impoverished Juniper Gardens area of the city. Most interventions of the time used a variety of methods and then measured results with IQ tests, but ours focused on building the everyday language the children were using, then evaluating the growth of that language. In addition, our study included not just poor children from Turner House, but also a group of University of Kansas professors' children against whom we could measure the Turner House children's progress.

All the children in the program eagerly engaged with the wide variety of new materials and language-intensive activities introduced in the preschool. The spontaneous speech data we collected showed a spurt of new vocabulary words added to the dictionaries of all the children and an abrupt acceleration in their cumulative vocabulary growth curves. But just as in other early intervention programs, the increases were temporary.

We found we could easily increase the size of the children's vocabularies by teaching them new words. But we could not accelerate the rate of vocabulary growth so that it would continue beyond direct teaching; we could not change the developmental trajectory. However many new words we taught the children in the preschool, it was clear that a year later, when the children were in kindergarten, the effects of the boost in vocabulary resources would have washed out. The children's developmental trajectories of vocabulary growth would continue to point to vocabulary sizes in the future that were increasingly discrepant from those of the professors' children. We saw increasing disparity between the extremes--the fast vocabulary growth of the professors' children and the slow vocabulary growth of the Turner House children. The gap seemed to foreshadow the findings from other studies that in high school many children from families in poverty lack the vocabulary used in advanced textbooks.

Rather than concede to the unchangeable forces of heredity, we decided that we would undertake research that would allow us to understand the disparate developmental trajectories we saw. We realized that if we were to understand how and when differences in developmental trajectories began, we needed to see what was happening to children at home at the very beginning of their vocabulary growth.

We undertook 2 1/2 years of observing 42 families for an hour each month to learn about what typically went on in homes with 1- and 2-year-old children learning to talk. The data showed us that ordinary families differ immensely in the amount of experience with language and interaction they regularly provide their children and that differences in children's experience are strongly linked to children's language accomplishments at age 3. Our goal in the longitudinal study was to discover what was happening in children's early experience that could account for the intractable difference in rates of vocabulary growth we saw among 4-year-olds.

Methodology

Our ambition was to record "everything" that went on in children's homes--everything that was done by the children, to them, and around them. Because we were committed to undertaking the

labor involved in observing, tape recording, and transcribing, and because we did not know exactly which aspects of children’s cumulative experience were contributing to establishing rates of vocabulary growth, the more information we could get each time we were in the home the more we could potentially learn.

We decided to start when the children were 7-9 months old so we would have time for the families to adapt to observation before the children actually began talking. We followed the children until they turned three years old.

The first families we recruited to participate in the study came from personal contacts: friends who had babies and families who had had children in the Turner House Preschool. We then used birth announcements to send descriptions of the study to families with children of the desired age. In recruiting from birth announcements, we had two priorities. The first priority was to obtain a range in demographics, and the second was stability--we needed families likely to remain in the longitudinal study for several years. Recruiting from birth announcements allowed us to preselect families. We looked up each potential family in the city directory and listed those with such signs of permanence as owning their home and having a telephone. We listed families by sex of child and address because demographic status could be reliably associated with area of residence in this city at that time. Then we sent recruiting letters selectively in order to maintain the gender balance and the representation of socioeconomic strata.

Our final sample consisted of 42 families who remained in the study from beginning to end. From each of these families, we have almost 2 1/2 years or more of sequential monthly hour-long observations. On the basis of occupation, 13 of the families were upper socioeconomic status (SES), 10 were middle SES, 13 were lower SES, and six were on welfare. There were African-American families in each SES category, in numbers roughly reflecting local job allocations. One African-American family was upper SES, three were middle, seven were lower, and six families were on welfare. Of the 42 children, 17 were African American and 23 were girls. Eleven children were the first born to the family, 18 were second children, and 13 were third or later-born children.

What We Found

Before children can take charge of their own experience and begin to spend time with peers in social groups outside the home, almost everything they learn comes from their families, to whom society has assigned the task of socializing children. We were not surprised to see the 42 children turn out to be like their parents; we had not fully realized, however, the implications of those similarities for the children’s futures.

We observed the 42 children grow more like their parents in stature and activity levels, in vocabulary resources, and in language and interaction styles. Despite the considerable range in vocabulary size among the children, 86 percent to 98 percent of the words recorded in each child’s vocabulary consisted of words also recorded in their parents’ vocabularies. By the age of 34-36 months, the children were also talking and using numbers of different words very similar to the averages of their parents (see the table below).

Families’ Language and Use Differ Across Income Groups						
Measures & Scores	Families					
	13 Professional		23 Working-class		6 Welfare	
	Parent	Child	Parent	Child	Parent	Child
Protest score ^a	41		31		14	
Recorded vocabulary size	2,176	1,116	1,498	749	974	525
Average	487	310	301	223	176	168

utterances per hour ^b						
Average different words per hour	382	297	251	216	167	149

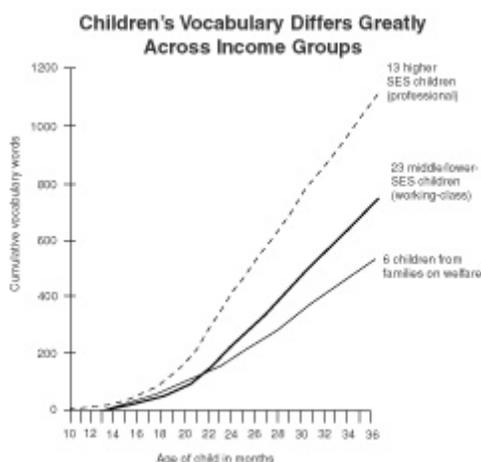
^a When we began the longitudinal study, we asked the parents to complete a vocabulary pretest. At the first observation each parent was asked to complete a form abstracted from the Peabody Picture Vocabulary Test (PPVT). We gave each parent a list of 46 vocabulary words and a series of pictures (four options per vocabulary word) and asked the parent to write beside each word the number of the picture that corresponded to the written word. Parent performance on the test was highly correlated with years of education ($r = .57$).

^b Parent utterances and different words were averaged over 13-36 months of child age. Child utterances and different words were averaged for the four observations when the children were 33-36 months old.

By the time the children were 3 years old, trends in amount of talk, vocabulary growth, and style of interaction were well established and clearly suggested widening gaps to come. Even patterns of parenting were already observable among the children. When we listened to the children, we seemed to hear their parents speaking; when we watched the children play at parenting their dolls, we seemed to see the futures of their own children.

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 dissembled 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.

After all 1,318 observations had been entered into the computer and checked for accuracy against the raw data, after every word had been checked for spelling and coded and checked for its part of speech, after every utterance had been coded for syntax and discourse function and every code checked for accuracy, after random samples had been recoded to check the reliability of the coding, after each file had been checked one more time and the accuracy of each aspect verified, and after the data analysis programs had finally been run to produce frequency counts and dictionary lists for each observation, we had an immense numeric database that required 23 million bytes of computer file space. We were finally ready to begin asking what it all meant.



It took six years of painstaking effort before we saw the first results of the longitudinal research. And then we were astonished at the differences the data revealed (see the graph at left).

Like the children in the Turner House Preschool, the three year old children from families on welfare not only had smaller vocabularies than did children of the same age in professional families, but they were also adding words more slowly. 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.

While we were immersed in collecting and processing the data, our thoughts were concerned only with the next utterance to be transcribed or coded. While we were observing in the homes, though we were aware that the families were very different in lifestyles, they were all similarly engaged in the fundamental task of raising a child. All the families nurtured their children and played and talked with them. They all disciplined their children and taught them good manners and how to dress and toilet themselves. They provided their children with much the same toys and talked to them about much the same things. Though different in personality and skill levels, the children all learned to talk and to

be socially appropriate members of the family with all the basic skills needed for preschool entry.

Test Performance in Third Grade Follows Accomplishments at Age 3

We wondered whether the differences we saw at age 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?

Fortune provided us with Dale Walker, who recruited 29 of the 42 families to participate in a study of their children's school performance in the third grade, when the children were nine to 10 years old.

We were awestruck at how well our measures of accomplishments at age 3 predicted measures of language skill at age 9-10. From our preschool data we had been confident that the rate of vocabulary growth would predict later performance in school; we saw that it did. For the 29 children observed when they were 1-2 years old, the 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 age 3 was equally predictive of measures of language skill at age 9-10. Vocabulary use at age 3 was strongly associated with scores on both the PPVT-R ($r = .57$) and the TOLD ($r = .72$). Vocabulary use at age 3 was also strongly associated with reading comprehension scores on the Comprehensive Test of Basic Skills (CTBS/U) ($r = .56$).

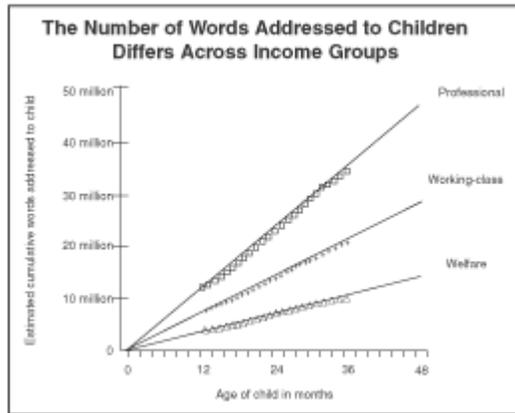
The 30 Million Word Gap By Age 3

All parent-child research is based on the assumption that the data (laboratory or field) reflect what people typically do. In most studies, there are as many reasons that the averages would be higher than reported as there are that they would be lower. But all researchers caution against extrapolating their findings to people and circumstances they did not include. Our data provide us, however, a first approximation to the absolute magnitude of children's early experience, a basis sufficient for estimating the actual size of the intervention task needed to provide equal experience and, thus, equal opportunities to children living in poverty. We depend on future studies to refine this estimate.

Because the goal of an intervention would be to equalize children's early experience, we need to estimate the amount of experience children of different SES groups might bring to an intervention that began in preschool at age 4. We base our estimate on the remarkable differences our data showed in the relative amounts of children's early experience: Simply in words heard, the average child on welfare was having half as much experience per hour (616 words per hour) as the average working-class child (1,251 words per hour) and less than one-third that of the average child in a professional family (2,153 words per hour). These relative differences in amount of experience were so durable over the more than two years of observations that they provide the best basis we currently have for estimating children's actual life experience.

A linear extrapolation from the averages in the observational data to a 100-hour week (given a 14-hour waking day) shows the average child in the professional families with 215,000 words of language experience, the average child in a working-class family provided with 125,000 words, and the average child in a welfare family with 62,000 words of language experience. In a 5,200-hour year, the amount would be 11.2 million words for a child in a professional family, 6.5 million words for a child in a working-class family, and 3.2 million words for a child in a welfare family. In four years of such experience, an average child in a professional family would have accumulated experience with almost 45 million words, an average child in a working-class family would have accumulated experience with 26 million words, and an average child in a welfare family would have accumulated experience with 13 million words. By age 4, the

average child in a welfare family might have 13 million fewer words of cumulative experience than the average child in a working-class family. This linear extrapolation is shown in the graph below.



But the children's language experience did not differ just in terms of the number and quality of words heard. We can extrapolate similarly the relative differences the data showed in children's hourly experience with parent affirmatives (encouraging words) and prohibitions. The average child in a professional family was accumulating 32 affirmatives and five prohibitions per hour, a ratio of 6 encouragements to 1 discouragement. The average child in a working-class family was accumulating 12 affirmatives and seven prohibitions per hour, a ratio of 2 encouragements to 1 discouragement. The average child in a welfare family, though, was accumulating five affirmatives and 11 prohibitions per hour, a ratio of 1 encouragement to 2 discouragements. In a 5,200-hour year, that would be

166,000 encouragements to 26,000 discouragements in a professional family, 62,000 encouragements to 36,000 discouragements in a working-class family, and 26,000 encouragements to 57,000 discouragements in a welfare family.

Extrapolated to the first four years of life, the average child in a professional family would have accumulated 560,000 more instances of encouraging feedback than discouraging feedback, and an average child in a working-class family would have accumulated 100,000 more encouragements than discouragements. But an average child in a welfare family would have accumulated 125,000 more instances of prohibitions than encouragements. By the age of 4, the average child in a welfare family might have had 144,000 *fewer* encouragements and 84,000 *more* discouragements of his or her behavior than the average child in a working-class family.

Extrapolating the relative differences in children's hourly experience allows us to estimate children's cumulative experience in the first four years of life and so glimpse the size of the problem facing intervention. Whatever the inaccuracy of our estimates, it is not by an order of magnitude such that 60,000 words becomes 6,000 or 600,000. Even if our estimates of children's experience are too high by half, the differences between children by age 4 in amounts of cumulative experience are so great that even the best of intervention programs could only hope to keep the children in families on welfare from falling still further behind the children in the working-class families.

The Importance of Early Years Experience

We learned from the longitudinal data that the problem of skill differences among children at the time of school entry is bigger, more intractable, and more important than we had thought. So much is happening to children during their first three years at home, at a time when they are especially malleable and uniquely dependent on the family for virtually all their experience, that by age 3, an intervention must address not just a lack of knowledge or skill, but an entire general approach to experience.

Cognitively, experience is sequential: Experiences in infancy establish habits of seeking, noticing, and incorporating new and more complex experiences, as well as schemas for categorizing and thinking about experiences. Neurologically, infancy is a critical period because cortical development is influenced by the amount of central nervous system activity stimulated by experience. Behaviorally, infancy is a unique time of helplessness when nearly all of children's experience is mediated by adults in one-to-one interactions permeated with affect. Once children become independent and can speak for themselves, they gain access to more opportunities for experience. But the amount and diversity of children's past experience influences which new opportunities for experience they notice and choose.

Estimating, as we did, the magnitude of the differences in children's cumulative experience before the age

of 3 gives an indication of how big the problem is. Estimating the hours of intervention needed to equalize children's early experience makes clear the enormity of the effort that would be required to change children's lives. And the longer the effort is put off, the less possible the change becomes. We see why our brief, intense efforts during the War on Poverty did not succeed. But we also see the risk to our nation and its children that makes intervention more urgent than ever.

Teaching Vocabulary Early, direct, and sequential

by Andrew Biemiller

During the past 10 years, Jeanne Chall [see [tribute](#), in this issue] encouraged me to focus on the study of vocabulary and how vocabulary growth might be encouraged. Both of us had come to the conclusion that vocabulary growth was inadequately addressed in current educational curricula, especially in the elementary and preschool years and that more teacher-centered and planned curricula were needed, just as had been the case with phonics. Jeanne had come to this conclusion through her work on the stages of reading development (Chall, 1983/1996), her work on textbook difficulty (Chall and Conard, 1991), and especially through the findings of her joint research project with Catherine Snow on families and literacy (Chall, Snow, et al., 1982), as summarized in *The Reading Crisis* (Chall, Jacobs, and Baldwin, 1990). In this book, Chall and her colleagues traced the relative decline in reading achievements experienced by working-class children who had become competent readers by third grade but whose vocabulary limitations increasingly had a negative effect on their reading comprehension as they advanced to seventh grade. (Jeanne mentioned to me several times her disappointment that *The Reading Crisis* was not more widely discussed.)

I had been particularly influenced by Wesley Becker's famous *Harvard Educational Review* article (1977) noting that the impact of early DISTAR success with decoding was muted for reading comprehension in later elementary grades by vocabulary limitations. Becker argued that this was a matter of experience rather than general intelligence by observing that while his DISTAR students' reading comprehension fell relative to more advantaged students by grade 4, their mathematics performance remained high. He suggested that the difference was that all the knowledge that is needed for math achievement is taught in school, whereas the vocabulary growth needed for successful reading comprehension is essentially left to the home. Disadvantaged homes provide little support for vocabulary growth, as recently documented by Hart and Risley (1995). I was further influenced by the finding of my doctoral student, Maria Cantalini (1987), that school instruction in kindergarten and grade 1 apparently had no impact on vocabulary development as assessed by the Peabody vocabulary test. Morrison, Williams, and Massetti (1998) have since replicated this finding. This finding is particularly significant in view of Cunningham and Stanovich's (1997) recently reported finding that vocabulary as assessed in grade 1 predicts more than 30 percent of grade 11 reading comprehension, much more than reading mechanics as assessed in grade 1 do. Finally, I have been influenced by the consistent finding in the oral reading miscue literature that when overall error rates reach 5 percent of running words (tokens), that "contextual" errors (those that make sense in context) virtually disappear. I infer from this that when readers (or listeners?) understand less than 95 percent of the words in a text, they are likely to lose the meaning of that text (and be especially unlikely to infer meanings of unfamiliar words).

In short, as Gough and Tunmer (1986) have pointed out, vocabulary development is both important and ignored. Can we--educators--do better, or are we simply bumping into constitutional limitations that are beyond the power of schools to affect? In the remainder of this article, I am going to summarize a few points that support the argument for an increased emphasis on vocabulary and suggest the need for a more teacher-centered and curriculum-structured approach to ensure adequate vocabulary development.

The consequences of an increased emphasis on phonics. In recent years, we have seen a tremendous emphasis on the importance of phonics instruction to ensure educational progress. We also have seen that while more children learn to "read" with increased phonics instruction, there have not been commensurate gains in reading comprehension (e.g., Gregory, Earl, and O'Donoghue, 1993; Madden et al., 1993; Pinnell et al., 1994). What is missing for many children who master phonics but don't comprehend well is vocabulary, the words they need to know in order to understand what they're reading. Thus vocabulary is the "missing link" in reading/language instruction in our school system. Because vocabulary deficits particularly affect less advantaged and second-language children, I will be arguing that such "deficits" are fundamentally more remediable than many other school learning problems.

Schools now do little to promote vocabulary development, particularly in the critical years before grade 3. The role of schooling in vocabulary acquisition has been the subject of much debate. Early (pre-literacy) differences in vocabulary growth are associated with social class (Duncan, Brooks-Gunn, and Klebanov, 1994; Hart and Risley, 1995; McLloyd, 1998). Nagy and Herman (1987) and Sternberg (1987) argue that much vocabulary acquisition results from literacy and wide reading rather than from direct instruction. However, it is obvious that a great deal of vocabulary acquisition occurs before children become literate, and before they are reading books that introduce unfamiliar vocabulary (Becker, 1977). Cantalini (1987) and Morrison, Williams, and Massetti (1998) both report that vocabulary acquisition in kindergarten and grade 1 is little influenced by school experience, based on finding that young first-graders have about the same vocabulary (Peabody Picture Vocabulary Test) as older kindergarten children. Cantalini reported the same result for second grade.

The relatively small number of words that need to be learned. It is sometimes argued that the number of words children need to learn is so great that this can only happen incidentally through wide reading (Anderson, 1996; Nagy and Herman, 1987; Sternberg, 1987). This argument is quite reminiscent of the argument that the spelling-to-sound structure of English is so difficult that it can't be taught but only learned through experience. In both cases, the complexity of what needs to be learned has been somewhat exaggerated. Many years ago, Lorge and Chall (1963) argued that traditional dictionary sampling methods for assessing vocabulary had greatly overestimated the volume of vocabulary children needed to acquire. As Lorge and Chall, Beck and McKeown (1990), and others have noted, we need to focus on root word growth rather than the acquisition of all inflected and derived forms of words. Jeremy Anglin's (1993) monograph suggests that children acquire about 1,200 root words a year during the elementary years with perhaps half that many root words learned per year prior to grade 1. (He also argues that perhaps twice that many words need to be learned, particularly including idiomatic forms.) My own research (Biemiller and Slonim, in press) suggests that the average number of root word meanings acquired per year may be somewhat smaller, more like 600 root word meanings a year from infancy to the end of elementary school. This conclusion, based on root word meanings sampled from Dale and O'Rourke's Living Word Vocabulary (1981), is partly based on the observation that many similar meanings are acquired at about the same age and probably do not require separate instruction.

Evidence that vocabulary differences present by grade 2 may account for most vocabulary differences in elementary school. There has been relatively little discussion or examination of individual differences in vocabulary growth. Hart and Risley (1995) observed large differences associated with word learning opportunities in the preschool years. In our current research,

Naomi Slonim and I are finding that large vocabulary differences are present by the end of grade 2--amounting to more than 3,000 root words between high and low quartiles in a normative population (Biemiller and Slonim, in press). After grade 2, cross-sectional data indicate that the lowest-quartile children may actually add root word vocabulary faster than the higher-quartile children. However, by grade 5, they have only reached the median for grade 2 children. Thus, if we could find ways of supporting more rapid vocabulary growth in the early years, more children would be able to comprehend "grade level" texts in the upper elementary grades. (Note that the "reading grade level" of texts is in fact almost entirely determined by the vocabulary load of those texts (Chall and Conard, 1991; Chall and Dale, 1995). Thus early vocabulary limitations make "catching up" difficult even though once in school, children appear to acquire new vocabulary at similar rates. To "catch up," vocabulary-disadvantaged children have to acquire vocabulary at above-average rates.

The sequential nature of vocabulary acquisition. Much evidence clearly indicates that vocabulary is acquired in largely the same order by most children. The existence of empirical vocabulary norms (as in the Peabody and Living Word Vocabulary) indicate that some words are acquired later than others. Slonim and I have found very high correlations (mostly over .90) between mean scores for words obtained from different grades (Biemiller and Slonim, in press). We also found that when data is ordered by children's vocabulary levels rather than their grade level, we can clearly identify a range of words known well (above 75 percent), words being acquired (74 percent-25 percent) and those little known. Furthermore, these ranges are sequential. At any given point in vocabulary acquisition, a preliminary conclusion from this work is that there are about 2,000-3,000 root words that a child is likely to be learning. This makes the construction of a "vocabulary curriculum" plausible.

Defining an essential vocabulary for high school graduates. A corollary of the sequential nature of vocabulary acquisition is the possibility of defining a common vocabulary needed by most high school graduates. Several studies have shown that college entrants need 11,000 to 14,000 root words, while college graduates typically have about 17,000 root words (D'Anna, Zechmeister, and Hall 1991; Goulden, Nation, and Read, 1990; Hazenberg and Hulstijn, 1996). We need further research on the degree to which we can identify these words. (It is clear that all do not know the same exact words. It is equally clear that there is a substantial common vocabulary plus a further more discipline-specific vocabulary.)

The hypothesis that most root word and idiomatic vocabulary learned before and during elementary school results from direct explanation of words. We know relatively little about the processes by which children add words to their vocabularies. Some of the data are negative--evidence that children do not easily acquire words by inference, especially children younger than age 10 (Robbins and Ehri, 1994; Werner and Kaplan, 1952). In Bus, Van Ijzendoorn, and Pellegrini's (1995) summary of the effects of reading to children, there is evidence that younger children profit less from simply being "read to." There is also positive evidence that children do readily acquire vocabulary when provided with a little explanation as novel words are encountered in context (Beck, Perfetti, and McKeown, 1982; Elley, 1989; Feitelson et al., 1986; Feitelson et al., 1991; Whitehurst et al., 1998). Preliminary evidence from directly interviewing children about word acquisition suggests that as late as grade 5, about 80 percent of words are learned as a result of direct explanation, either as a result of the child's request or instruction, usually by a teacher (Biemiller, 1999b). Overall, I believe that before age 10, the evidence supports the conclusion that a substantial majority of new root words are acquired through explanation by others (including explanations in texts) rather than by inference while reading, as has often been argued by Anderson, Nagy and Herman, and by Sternberg. For practical purposes, we should be prepared to ensure the availability and use of explanations of word meanings throughout at least the elementary school years.

Although children differ in their opportunities to learn words and the ease with which they learn words, evidence suggests that most can learn vocabulary at normal rates. There is

clear evidence that vocabulary is associated with socioeconomic status--presumably reflecting differences in opportunity (as documented by Hart and Risley, 1995; and Snow, Burns, and Griffin, 1998). There is also clear evidence relating vocabulary development to various phonological skills or capacities (e.g., Gathercole et al., 1997). It is likely that environment and "capacity" interact--that constitutionally more-advantaged children also may be environmentally more advantaged. However, a number of studies summarized in Biemiller (1999a), Stahl (1999), and elsewhere clearly indicate that children can acquire and retain two or three words a day through instruction involving contextualized introduction and explanation of new words. Furthermore, while less verbally fluent or lower vocabulary children and adolescents have been found to benefit little from inferring word meanings (Cain and Oakhill, in preparation; Elshout-Mohr and van Daalen-Kapteijns, 1987), more-direct approaches have been reported to work well with these children (see Elley, Feitelson, and Whitehurst references cited previously). Overall, I hypothesize that most children (90 percent plus) can acquire new vocabulary at rates necessary to reach "grade level" or near grade level vocabulary in middle elementary school, if given adequate opportunity to use new words and adequate instruction in word meanings.

The need for planned introduction and explanation of vocabulary plus various tools to help children become more independent in dealing with new vocabulary. I have suggested above the hypothesis that 80 percent or more of the root words learned by grade 6 are learned as a result of direct explanation by parents, peers, teachers, and texts. Those who learn more words almost undoubtedly encounter more words and receive more explanations of word meanings. This suggests that we could do considerably more than we now do to ensure the development of adequate vocabulary through systematic exposure to two to three new words a day combined with adequate explanation of these words and opportunities to use them. (I am referring to new meanings not simply words that are unfamiliar in print.) Present school practices fall far short of this objective in the primary grades. (Schools may do better in the upper elementary grades.) Other types of vocabulary instruction (e.g., using affixes, word family approaches, and direct instruction in inferencing) will also be useful, especially in grades 3 and above.

This particular objective raises the possibility of returning to a more basal approach, at least as one component of classroom language and reading instruction. If vocabulary acquisition is largely sequential in nature, it would appear possible to identify that sequence and to ensure that children at a given vocabulary level have an opportunity to encounter words they are likely to be learning next, within a context that uses the majority of the words that they have already learned. Some researchers are already beginning to work on this objective (e.g., David Francis and Barbara Foorman in Texas, Jan Hulstijn in the Netherlands, Margaret McKeown and Isabel Beck in Pittsburgh, William Nagy in Seattle, and John Morgan and myself in Toronto). Many problems need to be solved. Existing lists of words (e.g., Living Word Vocabulary) do not correspond closely enough to observed sequences of word acquisition to be great guides (although they are better than nothing). Word frequency in print data (e.g., Carroll, Davies, and Richmond, 1971) bears relatively little relationship to observed word knowledge. (In my studies, Carroll's SFI index accounted for 7 percent of observed root word knowledge. In contrast, Living Word Vocabulary levels accounted for more than 50 percent of our data.) William Nagy (personal communication) has proposed combining Dale and O'Rourke's data with expert ratings--a very plausible suggestion.

Given the establishment of plausible vocabulary lists, teachers could relate these lists to vocabulary being introduced in books (short stories, novels, texts) being studied, be aware of words to introduce or explain (or to query children about if they don't ask!), and be aware of some important words that aren't going to be covered in the established curriculum. These words could be taught directly, or other materials (e.g., stories to be read to class) could be introduced that include them.

Conclusion: A substantially greater teacher-centered effort is needed to promote vocabulary development, especially in the kindergarten and early primary years. In her last

book, *The Academic Achievement Challenge*, Jeanne Chall (2000) presented a summary of research supporting the effectiveness of "teacher centered" approaches to education. The information reviewed here similarly points to the need for more planned (but contextualized) introduction of vocabulary. This is especially true in the pre-reading years (before grades 3 or 4 when children begin to read books that are likely to introduce new vocabulary). Specifically, increased teacher-centered vocabulary work should include the deliberate introduction of a wider range of vocabulary in the early primary years through oral sources (most children are limited in what they can read at this age level), ensuring coverage of about 4,000 root words by the end of grade 2. In the later elementary years, continued development will include adding another 500 to 750 root words per year, additional idioms, and increased fluency in using derived words. In addition, in the upper elementary grades, instruction is needed in deriving word meanings from affixes, word families, etc., as well as in ways of inferring word meanings. If we are serious about "increasing standards" and bringing a greater proportion of schoolchildren to high levels of academic accomplishment, we cannot continue to leave vocabulary development to parents, chance, and highly motivated reading.

Thus, I strongly recommend a more teacher-directed and curriculum-directed approach to fostering vocabulary and language growth. If education is going to have a serious "compensatory" function, we must do more to promote vocabulary. Our current data show large "environmental" effects in kindergarten to grade 2. Large differences remain by grade 5 (e.g., children in the lowest grade 5 quartile have vocabularies similar to median second-grade children). Is this simply the product of "intelligence"? I believe it is in considerable part the result of different learning opportunities. After grade 2, vocabulary growth rates look similar or faster for "low quartile" children. If we could keep them from being so far behind by grade 2, they apparently wouldn't be so far behind in grade 5!

I don't believe we can make all kids alike. But I think we could do more to give them similar tools to start with. Some kids may have to work harder to add vocabulary. Educators may have to work harder with some kids. So what's new? But now, educators do virtually nothing before grade 3 or 4 to facilitate real vocabulary growth. By then, it's too late for many children.

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Overcoming the Language Gap

Make Better Use of the Literacy Time Block

By E. D. Hirsch Jr.

The latest fourth-grade reading scores for U.S. students made the front page of the New York Times with the headline: "Gap Between Best and Worst Widens on U.S. Reading Test." The reporter, Kate Zernike, observed that after a "decade-long emphasis on lifting the achievement of all students...the release of the scores led to a round of finger-pointing over the cause of the growing gap."

That would lead to some tired fingers. The gap has persisted for half a century. On that front--nothing new.

If not exactly news, the continued verbal gap between rich and poor students does deserve to be on the front page, not because of anything that happened or didn't happen last year, but because the fourth-grade reading gap (which widens in each succeeding grade) represents the single

greatest failure in American public schooling and the most disheartening affront to the ideal of democratic education.

This latest reading report from the National Assessment of Educational Progress documents a steady state. It shows no significant overall shift in American students' reading proficiency, nor any drastic widening of the already-large reading gap in fourth grade between rich and poor students. In 2000, there were minor gains at the top, and slight declines at the bottom, but no global change in overall achievement or in the gap between middle-class and low-income students, a gap that has been a disturbing feature of American schooling for at least fifty years.

Before NAEP began to record such findings, the fourth-grade reading gap had been documented by Walter Loban in the 1950s and 1960s, then by Jeanne Chall in the 1970s and 1980s. In 1964, Mr. Loban published a graph that still defines early reading in the United States. It coordinated achievement along the vertical axis and student age along the horizontal. On this matrix, he plotted two lines showing the performances of low-and high-income students. The graph looks like a tilted funnel, with the narrow end at the left starting at kindergarten. In kindergarten, the two sides of the tilted funnel are fairly close. They begin to separate sharply around grade four. After that, the gap keeps the same heartbreaking trajectory. Jeanne Chall called this sharp widening "the fourth-grade slump." The latest news from NAEP about fourth-grade reading is, in short, anything but new.

For the past four years, I've taught a graduate course at the University of Virginia school of education that has focused on the causes and cures of the test-score gap. Over those years, my students and I have looked at the work of the most distinguished researchers in sociology, economics, social psychology, cognitive psychology, and educational history. We have also looked at reports from the field.

Some of the news from the field is promising. A few schools, even a few districts such as Inglewood, Calif.--which serve many low-income students on free and reduced-price lunch--have made inroads into the test-score gap. And some reading programs like Open Court, Success for All, and Direct Instruction have, when well implemented, raised reading skills (decoding)--up to a point. But the early gains from those programs tend to fade by fourth grade, and students still suffer the Chall "fourth-grade slump."

Even the most effective public schools, like Nancy Ichinaga's Bennett-Kew School in Inglewood, have not been able to raise the verbal scores of disadvantaged students up to the level of their math scores. On the other hand, the gap-closing scores from some Core Knowledge schools are very promising. But as the president of the Core Knowledge Foundation, I am not the proper person to press that point. Rather, I shall summarize how the early reading gap can be reduced in all schools, if they will combine intimately a carefully worked-out reading (decoding) curriculum with a carefully worked-out content curriculum that develops academic knowledge and oral language during the long periods in the early grades that are currently (and very ineffectively) devoted to "language arts."

Although such an approach will greatly reduce the reading gap in all schools, no schools that I know of, including those calling themselves "comprehensive" and those calling themselves "Core Knowledge," have effectively integrated the time spent on reading "skills" with time spent on "subject matters" during the long periods devoted to "language arts" in the early grades. Instead, those critical periods of the day are devoted to a fragmented hodge-podge of mainly fictional stories--on the unexamined assumption that fiction is the essence of "language arts." By no means, of course, should we dispense with good stories for children. But the current emphasis on "imaginative fiction" and the lack of emphasis on history and science--or even on systematically enhancing basic speaking and listening skills--is yet another vestige of the romantic movement's emphasis on natural development and "creative imagination," and yet another barrier to narrowing the equity gap.

To understand what needs to be done, it's necessary first to grasp the cause and character of the current reading gap. And to view the gap accurately, it's essential to give it a new name. The gap can't be confined to reading, because it starts long before children are readers, and continues long after they have mastered decoding skills.

From age two on, there exist large differences in children's familiarity with unusual words, standard pronunciation, and complex syntax, a fact that was long suspected, but not well documented and quantified until the monumental research of Betty Hart and Todd Risley, as summarized in their book *Meaningful Differences*. Many a low-income child entering kindergarten has heard only half the words and can understand only half the meanings and language conventions of a high-income child. Our schools, as currently constituted, do not reduce this original knowledge/vocabulary gap.

The verbal gap is not effectively compensated for by programs like Direct Instruction and Success for All, which bring children to fluency in decoding skills yet do not sufficiently and systematically enlarge their vocabularies. Low-income children who read with fluency still typically show big deficiencies in vocabulary and comprehension. Hence, instead of the term "reading gap," clarity would be better served by using a more descriptive term like "language gap" or "verbal gap." Such a shift in terminology might reduce public confusion between "reading" in the sense of knowing how to decode fluently, and "reading" in the sense of being able to comprehend a challenging diversity of texts. It is the second, comprehension, deficit, based chiefly on a vocabulary deficit, that constitutes the true verbal gap indicated in the NAEP scores.

The widening of this verbal gap as students progress through the grades is the archetypal example of the so-called Matthew effect in education, "unto every one that hath shall be given, and he shall have abundance, but from him that hath not shall be taken away even that which he hath."

Cognitive psychologists have explained the mechanism for the Matthew effect, which is made even more acute by subsequent social and emotional influences on the low-vocabulary child. Experts in vocabulary estimate that to understand spoken or written speech, a person needs to know about 95 percent of the words. The other 5 percent of word meanings can then be inferred from context. If we assume that an advantaged kindergartner knows 95 percent of the words in a teacher's remarks, or in a passage read aloud from a book, the result is that the child is not only gaining new knowledge from the exposition, she is also gaining new word meanings, by being able to infer the meaning of the other 5 percent of the words--achieving a gain in both world knowledge and in word knowledge.

The less advantaged child, by contrast, suffers a double (or triple) loss. The exposition is puzzling from the start, because the child doesn't know enough of the words. He therefore fails to gain knowledge from the exposition and also fails to learn new word meanings from the context. And to intensify that double loss, the child loses even that which he hath--his interest, self-confidence, and motivation to learn.

Multiply that experience by dozens of similar daily experiences, and the underlying cause of the widening verbal gap becomes clear.

How can the gap be reduced? The Coleman Report of 1966 disclosed that a child's initial advantage of family and peers was more important to academic achievement than the school he or she attended. Then, in his later career, James S. Coleman, a hero to my students who have studied the test-score gap, devoted his extraordinary scholarship to qualifying that conclusion. Schools could reduce the academic-achievement gap, he found, by becoming more "intensive," by devising explicit academic standards for each grade, and making sure that every child meets those expectations. Since children are not at school all day and all year, school time must be

used effectively. Coleman found that schools, both public and private, that maintained this "intensiveness" provided much greater equality of educational opportunity than those that didn't.

Coleman's conclusion has been amplified by cognitive psychologists. The advantaged child has gained knowledge and a correspondingly large vocabulary chiefly by gradual, implicit means. The child has been read to, has heard complex syntax, has been told about the natural and cultural worlds in the ordinary course of growing up. This indirect and implicit mode of learning is excellent if one has lots of exposure and lots of time, as an advantaged child typically does. But the disadvantaged child has to make up for lost time, and cognitive psychologists tell us that this requires a very systematic, analytical, and explicit approach to early learning. If you want to learn fast--be explicit. Break down each domain to be learned into manageable elements that can be mastered. Then systematically build on that knowledge with new knowledge. This is the most efficient mode of learning for everybody, but it is the essential mode if the aim is to make up for lost time in knowledge and vocabulary.

That is the basic principle for overcoming the verbal gap. First, define the deficit by determining what knowledge and words are lacking. Then effectively teach that knowledge and those words.

My students and colleagues have some definite ideas about how to do this, ideally starting in preschool. Some enabling words and concepts will need to be taught directly, and we must do this systematically, as Andrew Biemiller of the University of Toronto has recommended. Yet we are well aware that most words will continue to be learned indirectly, in context, which is all the more reason to make sure that the context is carefully and cumulatively sequenced so that every child understands it, and makes new gains in knowledge and vocabulary.

Children learn and remember what is meaningful to them. History and science become meaningful if they are taught in a sustained and coherent way. All those currently fragmented hours devoted to "language arts" need to include the worlds of nature and history, literature, art, and music that will build the knowledge and vocabulary of children, and enable them to become readers in the true sense.

My graduate course on the verbal gap always ends in optimism. By the time we have gone through the relevant research, my students (who are mostly teachers or teachers-to-be) have concluded that the main barriers to equal educational opportunity are those that have been erected by unfortunate habits of mind in the schools and by an unfortunate tendency to believe that the job can't be done. While Jeanne Chall and James Coleman (and others) are my students' heroes, their only villain is the complacency caused by social determinism and IQ determinism--views that have currency only because we haven't yet managed to narrow the verbal gap.

Before giving way to determinism, however, we need to transform the hours devoted to the literacy block in preschool and in the early grades by doing what works best, according to the ablest researchers: providing an explicit, coherent, and carefully cumulative approach to a broad range of knowledge and language.

AMERICAN EDUCATOR MAGAZINE OFFERS PROMISING HYPOTHESIS FOR MAKING STUDENTS BETTER READERS

E. D. Hirsch and Other Scholars Suggest Ideas To Overcome Obstacles and Narrow the Achievement Gap

Washington, D.C. – The latest edition of AFT’s award-winning *American Educator* magazine features prominent education reformer E. D. Hirsch Jr. and other scholars working to meet the fundamental challenge facing America’s schools: helping students become better readers. The authors recommend specific changes in reading instruction and early childhood education that they believe could have a dramatic impact on students’ reading ability.

Reading problems are often hidden until fourth grade, when coursework and testing become more rigorous, according to Hirsch’s article, "Reading Comprehension Requires Knowledge – of Words and the World." To combat the fourth-grade slump, Hirsch argues that children need not only fluency and a strong vocabulary, but also "domain knowledge," which gives students a context for their reading and a deeper understanding of the material.

Hirsch also makes specific recommendations for changing the language arts curriculum. He suggests that teachers limit time spent on formal comprehension skills and place greater emphasis on immersing children in language and exposing them to broader ideas. Hirsch says that many schools allot up to 2.5 hours daily for language arts instruction, giving ample time for children to receive thorough instruction in decoding, which is a prerequisite for learning to read, and to acquire the vocabulary and background information they will need to comprehend more advanced texts.

Hirsch sees a strong connection between word knowledge and world knowledge. To take advantage of that connection, he recommends that teachers choose interesting, thought-provoking texts to read aloud to the class. The practice of teacher read-alouds, according to research Hirsch cites, is effective not just in the early grades, but even through the eighth grade. He also notes that many reading textbooks include "trivial literature" and empty fiction, which by definition fail to build vocabulary or world knowledge.

Other articles in *American Educator*’s spring issue also address the causes and cures of reading difficulties. In "The Early Catastrophe: The 30 Million Gap," researchers Betty Hart and Todd R. Risley write that vocabulary deficits start early. Average 4-year-olds in families whose parents are professionals are exposed to 32 million more words than their counterparts whose parents receive public assistance, according to Hart and Risley. The article underscores the importance of early childhood experiences, finding that vocabulary use at age 3 is an accurate predictor of language skill at ages 9 and 10.

In the article "Basal Readers: The Lost Opportunity To Build the Knowledge that Propels Comprehension," a review of the five most widely used K-3 reading textbooks, author Kate Walsh finds them to be far from adequate. Walsh cites several examples of lessons she considers trivial or pointless. She contends that none of the programs helps avert the fourth-grade slump and blames their ineffectiveness partly on the "mostly incoherent, banal themes" that do not teach children about the world.

To improve reading comprehension, Walsh prescribes content-rich stories and essays, teacher read-alouds that are two grade levels above the students’ level, and less time

devoted to acquiring formal comprehension skills that do not transfer to real-world reading.

The magazine also features "Filling the Nonfiction Void," which recommends using more and better nonfiction in the early grades, and "Taking Delight in Words," which calls for teachers to read aloud to their students to build vocabulary and instill a love of reading.

American Educator, the quarterly professional journal of the American Federation of Teachers, delves into the most current and thought-provoking issues in education. Its more than 750,000 readers include classroom teachers, leaders in the field of education, policymakers and other education personnel from preschool through university level.