

Whole Language vs. Code Emphasis: Underlying Assumptions and Their Implications for Reading Instruction

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Promoters of Whole Language hew to the belief that learning to read and write can be as natural and effortless as learning to perceive and produce speech. From this it follows that there is no special key to reading and writing, no explicit principle to be taught that, once learned, makes the written language transparent to a child who can speak. Lacking such a principle, Whole Language falls back on a method that encourages children to get from print just enough information to provide a basis for guessing at the gist. A very different method, called Code Emphasis, presupposes that learning the spoken language is, indeed, perfectly natural and seemingly effortless, but only because speech is managed, as reading and writing are not, by a biological specialization that automatically spells or parses all the words the child commands. Hence, a child normally learns to use words without ever becoming explicitly aware that each one is formed by the consonants and vowels that an alphabet represents. Yet it is exactly this awareness that must be taught if the child is to grasp the alphabe-

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tic principle and so understand how the artifacts of an alphabet transcribe the natural units of language. There is evidence that preliterate children do not, in fact, have much of this awareness; that the amount they do have predicts their reading achievement; that the awareness can be taught; and that the relative difficulty of learning it that some children have may be a reflection of a weakness in the phonological component of their natural capacity for language.

Various studies have estimated the number of children who fail at reading to be 20–25 percent of the school population (Stedman and Kaestle 1987). While it is generally agreed that this presents a serious problem, opinion is deeply divided about its underlying causes and inevitably, therefore, about the proper route to its solution. In this paper, we will explore two current views. One of these is commonly referred to by its partisans as Whole Language; the other, which we embrace, we call Code Emphasis, borrowing the name given it by Jeanne Chall (1967).

At the level of their most fundamental assumptions, Whole Language and Code Emphasis stand in stark contrast. Whole Language proceeds from the premise that learning to speak and learning to read are entirely comparable instances of language development. From this it follows that learning to read can and should be as effortless as learning to speak. Code Emphasis, on the other hand, recognizes that speech and reading must follow very different developmental paths. Speech is wholly natural, an integral part of the child's specialization for language. Because this specialization provides an automatic, tacit command of the complex relation between the sounds of speech and the abstract phonological structures they communicate, the acquisition of speech, whether in production or perception, is relatively effortless. A writing system, on the other hand, is an artifact, a biologically secondary code that maps to its natural language base in ways that must be quite consciously understood if it is to be used properly. Accordingly, learning to read is, in the Code Emphasis view, a cognitive, intellectual achievement in a way that learning to speak is not. It is simply wrong to suppose, as Whole Language does, that they can be learned in the same epigenetic way.

What's Right With Whole Language

Some of what Whole Language espouses is undeniably right and inherently appealing, which may account for the wide currency it now enjoys. But this is so, in our view, only to the extent that it offers suggestions about instruction that sensible people like your grandmothers and ours would have regarded as truisms. Other, more fundamental,

aspects of the Whole Language position are demonstrably false in ways that we will develop later.

But first let us consider some of the truisms. In a parent-teacher guide to the Whole Language movement that we take as our primary source (Goodman 1986), Kenneth Goodman (past president of the International Reading Association as well as a founding father and leading writer in the Whole Language movement) makes numerous suggestions that no good teacher we know would quarrel with. For example, he says that we need committed teachers who will serve eagerly as "guides, facilitators, kid watchers" (p. 44), that in the preschool years children would profit from "literate environments with functional print everywhere" (that is, homes and schools with freely available books and magazines), as they would from "environments in which teachers and parents themselves enjoy reading, read to their children, take them to libraries, and generally expand the children's awareness of the functions of print" (p. 44).

The parent-teacher guide offers some equally unobjectionable ideas for the beginning literacy program. For example, it says that the best books for first graders are those with predictable stories that use frequent word repetitions, together with cyclical sequencing that provides lots of productive, self-motivating practice (p. 47). We cannot take exception to these notions either, except to remark that they are hardly original with Whole Language or with us, having been preempted by writers of children's stories from Mother Goose to Dr. Seuss.

The guide also recommends that reading and writing be integrated so that children can understand their reciprocal relationship (p. 47). It urges that schools should build on the language development children have attained before they reach school and expand it (p. 10). And it urges further that schools "respect learners: who they are, where they come from, how they talk, what experiences they had before coming to school" (p. 10).

There is a good deal more of this kind of advice in the parent-teacher guide. Though obvious, much of it nevertheless deserves more emphasis than it usually gets, and the Whole Language people are right to provide it. Surely, it is good to identify and promote practices that have been part of every good teacher's repertoire since the teaching of reading began.

What's Wrong With Whole Language

To find the important differences between Whole Language and Code Emphasis, one must put aside the easy truisms and look more

deeply into the assumptions the two views make about the nature of language itself, and about the similarities or differences between the processes that underlie its spoken and written forms. What we see there, and what we mean now to say, is that the basic assumptions of Whole Language are wrong, and that they lead to recommendations about reading instruction that we consider grievously misguided. To avoid a common misunderstanding, we should recognize at this point that lots of children—perhaps as many as 75 percent—will discover the alphabetic principle, which is what they must understand if they are to read, no matter how unhelpful the instruction. But we find it ironic that, in order to succeed, these children might have to prevail over the misunderstandings of their teachers. Would even they not be better served by instruction that is designed to teach them what they need to know? In any case, we are left with the 20–25 percent who will *not* discover the point of the alphabet except as it is made apparent to them by appropriate instruction.

So let us examine a basic assumption of Whole Language, as exemplified by Goodman's description of a paradox he sees in the contrast between the ease of learning to speak and the relative difficulty of learning to read. He reminds us that infants learn to speak a language in a very short time and without formal training, but, when they reach school age, many of them begin to have difficulty with the kind of language development that Goodman associates with learning to read (p. 7). In his view, infants are "good at learning language when they need it to express themselves, as long as they are surrounded by people who are using language meaningfully and purposefully." As he sees it, children would be just as good at learning to read if only the task were made similarly meaningful and purposeful. Unfortunately, according to Goodman, teachers make learning to read difficult, "by breaking whole (natural) language into bite-size, abstract little pieces." School traditions, he says, "took apart the language into words, syllables, and isolated sounds." And this "postponed its natural purpose—the communication of meaning—and turned it into a set of abstractions unrelated to the needs and experiences of the child we sought to help." (p. 7).

That may sound plausible, but in our view it could hardly be more wrong. We agree, of course, that most children quickly master speech well enough to communicate usefully, and that, typically, they do this without explicit instruction, while, in contrast, many fail to learn to read and write. But before we accept Goodman's explanation that the schools are at fault by making a naturally easy task difficult (p. 8), we should ask two questions: first, is reading, like speaking, really all that natural; and, second, if not, what more is required if the child is to read and write?

To understand that the answer to the first question is an unqualified 'no,' one has only to consider such obvious facts about language as the following:

1. All communities of humans have a fully developed spoken language, but only a minority of these exists in a written form. Where there is a written form, many competent speakers do not, and indeed, cannot use it effectively, no matter how strong the pressure to do so.
2. In the history of the race, as in the development of the child, speech comes first, reading second. Apparently, speech is as old as the human species, having evolved with it as perhaps the most important of its species-typical characteristics; alphabets, on the other hand, are developments of the last three or four thousand years, and they are cultural achievements, not the primary products of biological evolution.
3. Reflecting biological roots that run deep, speech employs a single, universal strategy for constructing utterances. All languages form all words (hence all utterances) by combining and permuting a few dozen consonants and vowels, meaningless segments that we will sometimes refer to, loosely, as phonemes. On the other hand, scripts, being artifacts, choose variably from a menu of strategies. Some, like the one we use, represent the phonemes. Others represent the more numerous syllables or, as in the case of Japanese, moras. Still others, like the Chinese, take the considerably more numerous morphemes as their irreducible units.
4. In order to develop speech, the normal child need only be in an environment where language is spoken; reading, on the other hand, almost always requires explicit tuition.

Given these telling facts about the differences between speech and script, it has to be both wrong and misleading to suppose, as Whole Language seems to, that they are psychologically and biologically equivalent vehicles for language. It must be equally wrong, though perhaps even more misleading, to conclude, then, as the parent-teacher guide does (p. 24), that learning to read is, or can be, as natural a part of language development as learning to speak. Surely, it is plain that speech is biologically primary in a way that reading and writing are not. Accordingly, we suppose that learning to speak is, by the very nature of the underlying process, much like learning to walk or to perceive visual depth and distance, while learning to read and write is more like learning to do arithmetic or to play checkers. Just because learning to speak and learning to read can both be viewed as forms of

language development—in the vacuous sense that both reflect the effect of experience on language behavior—it simply does not follow, as Whole Language would have it, that they are therefore equivalent forms of development, or that they can be instructed by experience in the same natural, unconscious way.

And so we are brought to the second question: Given children who have learned to speak, typically without conscious awareness of the underlying linguistic structures and processes they naturally deploy, what more must they learn if they would exploit their already impressive command of the language for the purpose of reading and writing it by means of an alphabet?

To see most clearly what more the would-be reader must learn about language, we need first to appreciate the critical differences between language and other natural means of communicating meanings because that is where the most important aspects of the disagreement between Whole Language and us have their roots, and where we find the basis for the very different ways they and we understand the reading problem. We begin by reminding ourselves that consonants and vowels are the essential structural elements of the phonological component of the child's natural capacity for language. The obvious and critically important function of the phonology is to form meaningful words by combining and permuting its small inventory of meaningless and abstract units in the elegantly principled ways that linguists have been concerned to characterize. For our purposes, however, it is important to know about the phonological strategy only that it is crucial for language because it makes possible vocabularies tens or even hundred of thousands of times larger than could ever be managed if, as in all nonhuman systems, the signal for each "word" were holistically different from every other one (See Liberman and Studdert-Kennedy 1978 for further discussion). Thus, the phonology is not merely an inventory of sounds, but a marvelous system that comprehends all the words of the language, including even those that have yet to be uttered. It relates sound to meaning in a way that makes it one of the two properties (syntax is the other) that permits languages to be open and generative—that is, to convey an indefinitely large number of meaningful messages, including novel ones.

Communication among nonhuman animals is different in a critically important way, for, so far as anyone has been able to determine, the natural animal systems have no phonology (nor do they have syntax, for that matter), and, as a consequence, their message-carrying potential is severely limited. Lacking the phonological structures that make lexical generativity possible, nonhuman animals can convey in their natural communication only as many word-meanings as there are distinctively different signals they can make and perceive, and that is,

at most, a few dozen. Moreover, short of calling a convention and getting all the animals to agree on a hitherto unused signal-to-meaning link, there is no way the animals can communicate a novel message. Thus, in contrast to language, which is lexically open because word meanings are conveyed by arranging and rearranging meaningless signal elements, the nonhuman systems attach meaning directly to each element and are, as a consequence, tightly and irremediably closed.

We see, then, that language would pay a terrible price if it were not phonologically based. Perhaps it would be of some comfort to the Whole Language people that in such a nonphonological world there would be no 'bite-size, abstract little pieces' for teachers to break a word into, and so postpone its natural purpose—the communication of meaning. Each word would be conveyed by an unanalyzable signal, so meaning would be conveyed directly, just as Whole Language seems to think it should be. Unfortunately, there would not be many words.

In telling its very different story about the human and nonhuman capacities for communication, Whole Language scants the phonological faculty, emphasizing instead that our communication system is as it is because, by comparison with other species, we have (1) more to say, (2) a greater capacity for using symbols, (3) a need for social interaction, and (4) intelligence. The clear implication is that it is primarily these factors that make it possible for the child, but not the monkey, to learn language either in its spoken or its written form.

But, surely, animals do have something to say, and the most superficial study of the science of ethology reveals that many of them say it unerringly, often, and insistently. Whether what they say is "symbolic" depends on just exactly what one means by a symbol. Is a bird behaving symbolically when it produces a so-called 'mobbing' call? Does this call "symbolize" the presence of a predator, as well as the bird's desire to enlist the cooperation of its fellows in protecting their common interests? As for social interaction, many animal species are dependent on it for their very survival, and the biologically necessary interaction is always maintained, as it is in us, by communication. This leaves intelligence, about which we would only offer the notion that, whatever intelligence is taken to be, there is no strong reason to suppose that language is its inevitable product. Indeed, the matter might better be put the other way around: we may be intelligent, or, at least, appear so, because, being endowed with the species-typical and biologically distinct devices of phonology (and syntax)—the devices that critically distinguish language from all other forms of natural communication—we can manage cognitive processes in ways that creatures not so endowed must find impossible. Seen this way, language is not so much a result of intelligence as it is a critically important tool that an intelligence can use. Of course, a person with low intelligence will

find that much less to do with the tool, and his use of it will surely reveal the poverty of his cognitive resources. But intelligence does not *cause* language, and it is not a truly sufficient condition for learning to read. Surely, there are intelligent people in societies which boast no readers.

So, in its most fundamental assumptions about language and its expression in speech or script, we find the parent-teacher guide doubly mistaken; first, in its assertion that learning to read can be like learning to speak, and, second, in its assumptions about the conditions that cause either kinds of learning to occur. We take it as undeniable that learning to read is *not* like learning to speak. As for the conditions that underlie learning to speak, they are but two: being neurologically normal in the several aspects of the language faculty, and having a normal exposure to the mother tongue. Learning to read imposes further requirements, of which more later.

Being neurologically normal for language means, *inter alia*, that the child has a natural capacity—indeed, a positive affinity—for phonological structures. This is why children are, in George Miller's apt phrase, 'spontaneous apprentices' in the business of language (Miller 1977), acquiring new words at such a phenomenal rate that by the time they are six years of age they command a vocabulary of 13,000 words, of which 7800 are root forms. One year later their vocabulary comprises 21,600 words (12,400 roots), and just one year after that it has grown to 28,300 words and 17,600 roots (Templin 1957). Such prodigies of language development would not be possible if there were no phonological system, and if children did not have, by virtue of their biology, a tacit command of its underlying structures and mechanisms (see Studert-Kennedy 1987 and M. Y. Liberman 1983 for pertinent discussions).

We take it as given, therefore, that in teaching children to read and write, our aim must be to transfer the wonders of phonology from speech to script. In our view, this can be done only if the child comes to understand the alphabetic principle, the insight that words are distinguished from each other by the phonological structure that the alphabet represents. Surely, this is the principle that links the less natural mode of written communication to its natural, spoken base, and so makes available to the reader-writer the ready-made phonological system that gives to speech the incalculable advantages it enjoys.

But why might it be hard for children to grasp the alphabetic principle and so gain access to a phonology they have already pretty well mastered? To answer that question, which takes us to the very heart of the reading problem, we must first bother to understand how the phonemes are produced and perceived in speech, for only then can we see precisely how far these processes must be different in writing and reading.

Consider, then, that if, as in every language, all utterances must be formed by variously stringing together two or three dozen consonants and vowels, the strings must, inevitably, run to considerable lengths. As a practical matter, then, there must be a way of producing these strings at some reasonable rate. Speech (and language, for that matter) would be impossible if, instead of saying 'bag', we could only say 'buh, a, guh'; for to say 'buh a guh' is not to speak but to spell. In that case, language production would be impossibly tedious. To get a feel for what speech perception would be like, have someone spell a Victorian novel to you, letter by painful letter. Not only would communication be slow, but it would likely overreach the limits of working memory, and so make sentence comprehension all but impossible.

Of course, if speech were a matter of saying 'buh a guh' in place of 'bag,' then, as in the nonphonological case described above, the fundamental assumption of Whole Language would be more nearly right: reading and writing would be no more difficult and no less natural than speaking and listening, for any child who could say a word would, *ipso facto*, know how to spell and read it. But there would be no language worth writing and reading. Speech and language became possible only because there evolved in speech a specialization for the rapid and effortless production and perception of phonological structures. We and some of our colleagues believe that the strategy underlying this specialization was to define the phonemes, not as sounds, but as motor control structures we choose to call gestures. Thus, the phoneme we write as 'b' is a closing and opening at the lips; the phoneme we write as 'm' is that same closing and opening at the lips, combined with an opening of the velum; and so forth. In fact, the gestures are far more complex and abstract than this (see, for example, Browman and Goldstein 1985; Liberman and Mattingly 1985; Liberman and Mattingly 1989), but, for our purposes, the important consideration is only that the gestural strategy permits coarticulation. That is, it permits the speaker to overlap gestures that are realized by different organs of articulation (as in the case of lips and tongue in [ba]) and to merge gestures that are produced by different parts of the same organ (as in the case of the tip and blade of the tongue in [da]). The consequence is that people can, and do, regularly speak at rates of 10 to 20 phonemes per second, which is nearly an order of magnitude faster than they could otherwise manage. That phonological elements are best defined as gestures is an hypothesis. Coarticulation, on the other hand is a fact, an essential characteristic of every language in the world.

But coarticulation was not there for the taking. It required the evolution of special articulatory gestures that lend themselves to being coarticulated, and that have come to serve a linguistic purpose and no other. (Thus, they are not engaged in eating, swallowing, breathing, or

worrying a blackberry seed with the tongue.) It also required the evolution of a special method of controlling and coordinating these gestures, for speech mechanisms must produce enough overlap and merging to make high rates possible, while yet preserving the small set of invariant phonological structures that form all words (Lieberman and Mattingly 1989).

The relevance of all this to our concerns becomes apparent when one considers that, like other biologically specialized processes, those that exploit coarticulation to produce phonological structures go on automatically, below the level of awareness. The obvious consequence is that, to speak a word, a person need not know how to spell it, or even that it can be spelled. Nor does he need to know what articulatory gestures to make or how to make them. The speaker need only think of the word; the speech specialization does all the hard work for him, automatically selecting and coordinating the linguistically significant gestures that form the appropriate phonological structure.

Coarticulation has important consequences for speech perception as well (and hence for the would-be reader), for it folds into a single segment of sound information about several successive phonemes, and so relaxes the constraint on rate of perception imposed by the temporal resolving power of the ear (Lieberman et al. 1967). This produces a very complex relation between the sound and the phonological structure it conveys, but this considerable complication causes the listener no trouble; he has only to listen, for his phonological specialization parses the signal automatically, recovering the several coarticulated gestures that produced it. Once recovered in this automatic, precognitive way, the phonological structure that uniquely specifies the word is available for whatever further use is to be made of it. We see, then, that production and perception of speech is easy, not because its processes are simple—for they are, in fact, marvelously intricate—but because the underlying specialization is so wonderfully adapted to its complex task.

But why make such a fuss about how we produce and perceive phonological structures if our concern is with reading and writing and the difficulties that attend them? The point is obvious, or so it seems to us. Given the biological specialization we have described, there is ordinarily nothing in children's experience with speech that will acquaint them with the alphabetic principle—that is, nothing to make them aware that all words are specified by an internal phonological structure, the shortest elements of which are the phonemes that the letters of the alphabet represent. Thus, the speech specialization causes a word like 'bag' to be coarticulated into a single, seamless piece of sound, even though it comprises three discrete phonemes. Given the automaticity of that specialization, the constituent phonemes do not

ordinarily rise to the level of awareness. Therefore, the beginning reader does not understand why a word like 'bag' should be represented by three letters, or why its spelling should differ from that of 'sag' in the first letter, from 'big' in the second, and from 'bat' in the third. Moreover, the problem may resist the most obvious solution, because there is simply no way the teacher can divide the sound of 'bag' so as to recover its three phonemes. Saying 'buh a guh' to the child does not necessarily help all that much, since 'buh a guh' is the wrong word. At all events, we can now see that the normal processes of speech not only fail to reveal the internal structures of words, but may, indeed, obscure them. Of course, the requisite awareness can be developed, as it obviously has been in all literate people. Indeed, developing that awareness should be the first aim of the reading teacher. But that takes some doing.

All that we have said about the beginning reader applies to the condition of our ancestors at the time they developed the alphabet. After all, human beings had been producing and perceiving speech for tens or hundreds of thousands of years before that moment, just three or four thousand years ago, when it occurred to someone that words did not differ holistically, one from another, but only in the particulars of their internal structure. Given that momentous, if seemingly simple, linguistic discovery, it only remained for someone to get the idea that if each phonological element were represented by an identifiable, but wholly arbitrary, optical shape, then all could read and write, provided only that they knew the language and were consciously aware of the internal structure of its words.

Once again the wrong assumptions by Whole Language about the nature of spoken and written language lead them to advice about instruction that is, in our view, likely to be unhelpful. Thus, they assert in the guide (p. 9) that one trouble with reading instruction as it is sometimes practiced is that it is designed to make the child into a linguist. This, they say, is entirely unnecessary—after all, the child need not be a linguist in order to speak—and even harmful, since it makes learning to read an intellectual, and therefore disagreeable, task. For exactly the reasons we've just given, Code Emphasis agrees that a child need not be a linguist in order to speak. But it holds that to use an alphabetic writing system properly, the child must be led to the same linguistic insight—and it was a linguistic insight—that underlay the development of the alphabet. Becoming enough of a linguist to appreciate that all words have an internal structure need not be a disagreeable task, as we will argue later, but, agreeable or not, it is a necessary achievement for anyone who would take advantage of the alphabetic mode for the purpose of reading and writing.

So much, then, for the differences between Whole Language and

Code Emphasis in the assumptions they make about spoken and written language. We turn now, though only briefly, to an equally important difference between the two views in what they have to say about the nature of the reading process itself. Put with admirable succinctness by Goodman himself, the Whole Language assumption is that reading is a “psycholinguistic guessing game” (Goodman, 1976). By this, Goodman means that (presumably skilled) readers merely sample the print, apprehending some words and skipping others. Then, using their normal and natural language processes, they guess at the message by taking advantage of context, their knowledge of the world, or, indeed, anything else that will spare them the inconvenience of actually reading what the writer had, in fact, written. As we will see later, this leads the Whole Language people to advocate actually *teaching* the child to guess. But, for now, the point is simply that their fundamental assumption about skilled reading is contrary to fact. The elegant studies of eye movements during reading by Rayner and his associates have shown conclusively that good readers read every word (Rayner and Pollatsek 1987). It is only the poor readers who sample the print, picking out words here and there, and then guessing at the rest. Other studies by Perfetti’s group in Pittsburgh show that truly literate people are much less likely to use a guessing strategy (Perfetti and Lesgold 1979). And, finally, there is the demonstration by Gough and associates (Gough, Alford, and Holley-Wilcox, 1981) that, more often than not, guessing from context leads to errors of a most egregious sort. Thus, their well-educated skilled reader, given appropriate context and unlimited time, correctly guessed only one word in four.

Relevant Research

We have pointed to differences between Whole Language and Code Emphasis in their general hypotheses about the nature and causes of reading disability, and we have said how well or how poorly those hypotheses accord with some of the most basic facts about the nature of spoken and written language. It is time, now, to make these hypotheses more specific and explicit, and to inquire, at least briefly, into the research by which they are to be evaluated. We would, of course, like to be even handed in this matter, offering data on both sides of the argument. Unfortunately for that purpose, Whole Language seems to have led to little, if any, relevant research. Based, as it is, on the assumption that children should learn to read just as they learned to speak, Whole Language cannot have thought it relevant to discover what is necessary for reading beyond the conditions that were sufficient for the development of speech. Yet obvious and undeniable

facts about language tell us that something more *is* necessary, and common sense suggests that identifying this something provides the basis for knowing what a proper program of instruction must be designed to do. At all events, Whole Language has made no research contribution to this important issue. Nor have its partisans mounted studies aimed at finding out what distinguishes those children who become good readers from those who do not, or how to predict at an early stage which children are at risk of failure. In the case of the research that is relevant to one tenet of Whole Language—that is, the data we cited in connection with the claim that reading is psycholinguistic guessing—the outcome was, as we said, directly contrary to what Whole Language had, in the absence of any data, supposed to be the case. We therefore turn to the specific, testable questions about reading which Code Emphasis has led to, and to the research studies by which those questions have been, and are being, answered.

As we have said, our guiding premise is that proper use of an alphabetic script requires, most importantly, an awareness of the fact that words are specified by their internal phonemic structure and, further, that such awareness does not come for free. This has seemed to us quite obvious, given what we know about language and the way an alphabet conveys it. But it seems not to appear so to everyone—certainly not to the proponents of Whole Language—so we seek further support for it, not in anything more we might learn about language and alphabets—for the evidence there seems full and convincing—but rather more directly in the results of research on learning to read and on the difference between those who succeed and those who do not.

(1) *Is knowing a language sufficient to provide beginning readers with the phonological awareness that they need if they are to apply the alphabetic principle?* Phonological awareness means simply the more or less explicit understanding that words are made of discrete units—that a word like 'bag' has three such units, that 'brag' has four, and that 'brags' has five. It does not entail knowing how to spell a word, only that it *can* be spelled. On the basis of all the considerations about speech and the development of the alphabet that we summarized in the earlier parts of this paper, we many years ago (Lieberman 1973) assumed, as we have already said, that beginning readers would usually lack phonological awareness. Then, seeking direct support for our assumption, we tested it on preschoolers (Lieberman et al. 1974). Using a task that was presented (and accepted) as a tapping game, we found that only 17 percent of the kindergartners 'passed' according to any reasonable criterion of passing. (Many more —about 48 percent—performed well with syllables, which was to have been expected, since syllables, unlike phonemes, are always marked acoustically by a discrete, vocalic

center.) Thus, we found that relatively few kindergartners are aware that words can be taken apart into units like those the alphabet represents. Following that study, many others, using different kinds of measures, have arrived at the same conclusion (for reviews, see Blachman 1988; Routh and Fox 1984). Indeed, research on illiterate adults has shown that they, too, are lacking in phonological awareness (Byrne and Ledez 1983; Liberman et al. 1985; Lukatela, Liberman, and Shankweiler in preparation; Marcel 1980; Morais et al. 1979; Pratt and Brady 1988; Read and Ruyter 1985).

So it is now quite firmly established that neither experience with speech nor cognitive maturation is sufficient to acquaint a person with the principle that underlies all alphabets. As for the relatively few kindergartners who have the awareness that the use of an alphabet presupposes, we might guess that they have acquired it as a result of the kinds of more or less analytic linguistic activities they may have engaged in at home (rhyming and various linguistic games, for example) or even by observing the print of stories read aloud to them. In any case, the teacher should never assume that the beginning reader has achieved the cognitive insight about language that reading requires.

(2) *Are there individual differences in degree of phonological awareness that correlate with (are predictive of) reading achievement?* The answer to that question is presented very pointedly by Bryant and Goswami (1987), who say that "the discovery of a strong relationship between children's phonological awareness and their progress in learning to read is one of the great successes of modern psychology." The relevant evidence is most impressive, coming as it does from studies that covered a wide range of cultural and economic backgrounds, as well as a number of different languages: in English, (Blachman 1984; Bradley and Bryant 1983; Fox and Routh 1980; Goldstein 1976; Helfgott 1976; Liberman 1973; Mann and Liberman 1984; Olson et al. 1989; Treiman and Baron 1981); in Swedish, (Lundberg, Olofsson, and Wall 1980; Lundberg 1988; Magnusson and Naucler 1987); in French, (Bertelson 1987; Morais, Cluytens, and Alegria 1984); in Spanish, (de Manrique and Gramigna, 1984); in Italian, (Cossu et al. 1988); in Serbo-Croatian, (Lukatela, Liberman, and Shankweiler, in preparation). Indeed, several investigators have arrived at the conclusion that, of all possible tests, the kind that measures some aspect of phonological awareness is the best single predictor of reading achievement (Blachman 1988; Golinkoff 1978; Lundberg, Olofsson, and Wall 1980; Mann 1984; Routh and Fox 1984; Stanovich 1985; Vellutino and Scanlon 1987).

(3) *Can phonological awareness, as such, be taught to prereaders, and, if so, does teaching it have consequences for later achievement in reading?* Appropriate methods of reading instruction are, by their very nature, likely to make learners sufficiently aware of phonological structure to

allow them to appreciate, and hence to apply, the alphabetic principle. Whether or not the teacher is herself aware of the importance of phonological awareness, she is likely, given common sense and a reasonable approach to instruction, to call the children's attention to the internal structure of words and to how this structure is reflected in the alphabetic spelling. Indeed, it is presumably by this route that most of us learned what we needed to know. Moreover, as we pointed out earlier in this paper, some children will infer the principle, no matter how ill-advised the method of instruction. Still, it is important to know whether phonological awareness can be taught as a prelude to reading instruction, and whether such teaching has happy consequences, especially for children who are at risk. As for children at risk, Bradley and Bryant (1983) at Oxford University first identified them by appropriate measures of phonological ability at ages four and five, and then showed that specific training in phonological classification caused them to progress better in learning to read, as measured even four years later (Bradley 1988), than control groups that had equivalent training in semantic (as opposed to phonological) classification, or that received no linguistic training at all. Subsequently, Bertelson's group in Belgium (Content et al. 1986), Blachman in Syracuse (Ball and Blachman 1988), Lundberg's laboratory in Sweden (Lundberg, Frost, and Peterson 1988; Olofsson and Lundberg 1983) and Vellutino and Scanlon (1987) in Albany have all achieved salutary effects with training of normal randomly selected groups of kindergartners.

There is, then, considerable research support for the conclusion that phonological awareness can be trained in the prereader and that such training causes children to make better and faster progress when they later undertake to learn how to read and to spell. This conclusion applies to normal children and also to children who, because of deficiencies in measurable aspects of phonological awareness, are presumably at risk.

(4) *Given the differences among children in the ease with which they can be made aware of phonological structure, differences that correlate so highly with achievement in reading, where do we look to find the source of these differences?* Together with our colleagues, we are currently pursuing the hypothesis that the source is the phonological component of the child's specialization for language. If that hypothesis is correct, then relative difficulty in achieving phonological awareness should be only one of several symptoms. Among other symptoms of a weak phonology, we should expect problems with verbal short-term memory, because, as is well known, (Baddeley 1968; Conrad 1964; Liberman, Mattingly, and Turvey 1972), such memory requires the use of phonological structures. If those structures are weak, short-term memory should suffer. We are not surprised, therefore, to find that poor readers do, in fact,

perform more poorly than age-matched good readers on tasks requiring immediate memory of verbal items, though with nonverbal tasks, such as those that require memory for nonsense shapes or photographs of unfamiliar faces, the poor readers are not at a disadvantage (Gathercole and Baddeley 1989; Katz, Shankweiler, and Liberman 1981; Liberman et al. 1982; Mann and Liberman 1984; Rapala and Brady 1990; but see Pennington 1989).

Also consistent with the assumption that poor readers suffer from a relatively weak phonology is the finding by Brady and associates (Brady, Shankweiler, and Mann 1983) that poor readers need a higher quality of signal than good readers for error-free performance in the perception of speech, but not for the identification of nonspeech environmental sounds. The other side of this coin is the finding by Catts (1986) that reading-disabled junior high students made significantly more errors than matched normal pupils on demanding tasks of speech production (tongue twisters, polysyllabic words, and the like).

Even the well-documented naming problems of reading-disabled second-graders—problems that, on their face, invite an interpretation that places the problem in the semantic component—turn out on investigation to lie in the phonology. Thus, in a series of carefully controlled studies with the Boston Naming Test, Katz (1986) found that poor readers who misnamed objects could nevertheless describe their functions accurately, recognize the correct names when given a series of choices, or even generate the correct name when given a phonological prompt. Apparently, their problem was that they could not access the right phonological structure, presumably because it was weakly established.

Though this issue is far from settled, we are encouraged to believe that individual differences in the ease with which children grasp the alphabetic principle originate in the phonological component of their language faculty, not in some cognitive (for example, analytic) capacity that cuts across linguistic and nonlinguistic domains (for a review of the evidence, see Wagner and Torgesen 1987). Until we see compelling evidence to the contrary, we will, therefore, suppose that this is the right way to understand the child whose difficulties with reading do not extend to all intellectual tasks.

Instruction by Whole Language

Given the profound differences in the underlying assumptions of Whole Language and Code Emphasis, we should expect equally profound differences in the instructional methods they rationalize. In fact, these differences exist, though they are sometimes papered over by a

throw-away line or two in the parent-teacher guide. Thus, the parent-teacher guide does say (p. 46) "Cultivate the alphabetic principle." But it does not tell parent or teacher just exactly how it is to be cultivated or why. Instead, it devotes considerable space to promoting procedures that seem designed, not to reveal the principle, but to obscure it. Thus, it says (p. 43) that "literacy development is a matter of learning to use just enough print, language structure, and meaning, and to keep it all in the proper personal and cultural perspective." We are not told exactly how the beginner arrives at the decision that he has used "just enough print" or how he uses "the proper personal and cultural perspective" to learn to read. In any case, the guide repeatedly leaves the teacher with the notion that the alphabetically represented word is somehow an encumbrance rather than a medium for conveying meaning. Thus, the guide says "Readers are seeking meaning, not sounds or words," (p. 38), but does not explain how one reaches the meaning without grasping the words.

The guide does permit a little leeway—it allows readers to "use their developing phonic generalizations to help when the going gets tough," but goes on to warn that "If they are lucky enough *not* to have been taught phonics in isolation, with each letter equally important, then they will *not* be diverted from developing the strategies necessary to select just enough graphic information to get to the sense they are seeking" (p. 38). The guide suggests that instead of bothering with all the graphic information, "learners need to know which available cues are most useful in a particular written context." Figure 1 displays an exercise seen on a poster board in a reading-methods classroom in a School of Education where the Whole Language approach was in operation. The exercise was presumably meant to develop just such guessing skills. We find shocking the message it appeared to convey—that learning to guess meaning from that most minimal of graphic cues, the initial consonant or two is a desirable route to reading acquisition.

In much the same vein, the guide explains that in its natural, easy-going classrooms, "trial and error risk-taking on the part of the learner is an absolute requirement" (p. 43). In the risk-taking, guessing approach, the learner necessarily makes errors. Not to worry. The parent-teacher guide assures us that learners' errors are accepted, indeed "celebrated," if they contribute to making sense: "No one is perfect," says the guide, "and sense, rather than error-free performance is the main point of reading" (p. 47). Therefore, we are not surprised to learn from graduate students taking a course in reading at a university where Whole Language was favored that they are told to reward children who, for example, read "Crest" instead of "toothpaste" in a story about brushing teeth. Crest is a toothpaste, after all, their professor reminded them. Similarly, we see a feature story in the *New York Times*

Hey la la, Ho la la
 My d ___ and I
 Tr ___ to m ___
 With ch ___ and p ___
 Hey ___ ___, ___ ___ ___
 Oh d ___ t ___ c ___
 If y ___ ___ st ___
 We'll n ___ g ___ th ___

Figure 1. Poster found in a reading clinic classroom in a School of Education, apparently used to train children in guessing from context.

(March 31, 1990) about an adult in a community literacy class who reads "kids" for "children." Presumably, Whole Language would find this quite acceptable, even praiseworthy. Children are kids, aren't they? Surely, this is wholly consistent with what we learn from the parent-teacher guide, where we are told that such errors may be viewed as "charming indications of growth toward control of language processes" (p. 19). We fear that they may serve, instead, as indicators that the children are still out of the loop (*pace* President Bush), wholly ignorant of what the game is about. They will probably not figure it out on their own, and their errors will become less and less charming as time goes on. We can only hope that when these readers graduate into the real world they will not skip the words they cannot read or substitute their own words in the instruction manuals they use to operate the machinery of the workplace.

Lest you suppose that the parent-teacher guide we have been quoting is not representative of the thinking of the Whole Language movement (even though it is written by their leading author), let us quote from a recent issue of the Whole Language Teachers Newsletter (Spring 1988) about what to do if the reader encounters an unfamiliar

word (we are grateful to Professor Charles Read for calling our attention to this). The newsletter says:

Foremost on the list of Don'ts are sound-it-out and look-for-familiar-word-parts-within-the-word because these activities divert the reader's attention from meaning . . . Good Things to Do include skip it, use prior information . . . read ahead, re-read, or put in another word that makes sense.

But all of this has got to be bad advice. For, surely, what the reader wants to get from the printed page is what the writer *actually* said, not what the reader thinks he *might* have said, given the reader's guess from context and his 'cultural and personal perspective.' Is it not just the most accomplished writers who, in an effort at precision and style, tend to avoid the inexact, soggy, and cliché-ridden prose that results when words are made to appear only in those contexts so very usual that guessing is, in fact, as good as reading? And is it not just that text which is designed to inform the readers, instead of repeating what they already know, that will necessarily lie outside their 'personal and cultural perspective.' If the readers are relying on what they already know, as Whole Language would have them do, how on earth are they ever going to use reading to learn something new? And how, if they follow the prescriptions of Whole Language, could they ever appreciate the beauty of poetry or the majesty of the Gettysburg Address? Are the readers to substitute their guesses for the words of Shakespeare and Lincoln? Are not the 'cultural and personal perspective' of the writer more important than those of the reader if the reader is to understand what the writer wrote?

We are here reminded of a pertinent example of how a dyslexic boy in the third grade, a child who had not mastered the alphabetic principle, attempted to follow a 'psycholinguistic-guessing-game' approach and the principles recommended in the Whole Language newsletter. (Though this episode occurred in the clinical practice of one of us some thirty years ago, she has never forgotten it.)

The child was given a passage to read, the first sentence of which was: "A boy said, 'Run little girl.'" The child knew how to read the word 'A' correctly, probably because it is the name of the letter. When he came to the word, 'boy', he engaged in guessing and risk-taking as recommended in the guide and produced "baby", presumably on the basis of a cue available to him—the 'b'. Now he had 'A baby'. He didn't know 'said' so he looked ahead and found 'run', which he did know. But what to do with the word between 'baby' and 'run'? Well, he used his "intact language skills" and figured that since there was an 's' in the word, and since he needed something to fill in there, he would say 'is

running' because that would make sense syntactically (though it may be somewhat dubious semantically). But then he ran into a big snag. Unfortunately, 'little' was a word he knew by sight, so he was forced to read it correctly. Now his sentence said, "A baby is running little," and he was confronted with the word 'girl' that he did not know. At this point he gave up trying to make sense and simply threw in 'go' which he knew begins with the right letter. And his sentence now read "A baby is running little go." So much for the guide's assumption that "kids are universally able to sort out language as they use it to meet their functional needs." So much for children's ability to use their "developing phonics generalizations to help when the going gets tough" (p. 38) and so much for using "their prior learning and experience to make sense of the texts, guessing what will occur next." And so much for their ability "to select just enough graphic information to get to the sense [they are] seeking."

A three-step Whole Language procedure for introducing children to the reading process that appeared recently in an academic journal seems to rise above the print altogether, disregarding the information that letters, as opposed to pictures, are supposed to convey (Norris 1989). In the first step, after reading the children the story of Goldilocks and the Three Bears, the teacher asks them to draw pictures of the story. We are told that the teacher then "reads the pictures" the child has drawn, saying "Once upon a time there were three bears—a papa bear, a mama bear, and a baby bear." In the second step, the teacher asks the children to add letters to the picture. The children, who apparently have not been taught much about letters, scrawl some marks on the paper. The teacher points to the marks while saying: "This says, 'Papa bear's porridge was too hot.' This word says, 'Mama bear's porridge is too hot.'" (In our day Mama bear's porridge was too cold and Baby bear's was just right—but this is apparently a different story.) Finally, the teacher asks the children to use the bears' names in their story and shows them how the names are represented in the book. The children copy some of the letters, apparently at random—in the figure accompanying the article the letters include a string of L's and T's and another of capital- and lower-case b's and some figures that look like 8's. The teacher points to the child's letters while saying: "You wrote about Baby Bear. Baby Bear's porridge was too hot." This sort of thing might be acceptable as a game for two- and three-year olds, but it is so misleading as to be questionable even for them. Those pictures the children drew do *not* say "Once upon a time there were three bears." The scrawls they made tell nothing about the heat of the porridge. Nor do the letters the children selected to copy from the printed story relate to the words in the story. Encouraging a child in this way to believe that they do may plant the false notion that print is like a picture.

Code Emphasis and the Alphabetic Principle

We have offered ample reason to believe that, by the very nature of the difference in underlying process, learning to read will not be so easy and effortless as learning to speak, whether the approach is Whole Language or Code Emphasis. But just because Code Emphasis makes intellectual demands of the child, it does not follow that its procedures must entail the mindless, sounding-out drills that the parent-teacher guide fears. In fact, Code Emphasis can be carried out in a pleasant, game-like atmosphere, with children participating happily, and with rapidly growing understanding of the alphabetic principle. Appropriate procedures have been described in detail elsewhere (e.g., Blachman 1987; Elkonin 1973; Engelmann 1969; Gallistel, Fischer, and Blackburn 1977; Liberman 1989; Liberman et al. 1980; Lindamood and Lindamood 1975; Gillingham and Stillman 1956; Rosner 1975; Slingerland 1971), and cannot, for want of space, be given here. Suffice it to say that not only can all these procedures be presented in ways that are enjoyable for the child, but they can also be effective, even in inner-city schools, as is strongly suggested by the dramatic increases in reading scores that were obtained after the procedures were introduced (Blachman 1987; Enfield 1987; Calfee, Lindamood, and Lindamood 1973; Wallach and Wallach 1976; Williams 1985).

The gains in reading in some of these studies were measured by determining how well a child could read isolated words (e.g., Calfee, Lindamood, and Lindamood 1973) but in others (Blachman 1987; Enfield 1987), standard tests of reading comprehension were used. Moreover, research evidence supports the intuitively obvious view that skill in comprehension is highly correlated with skill in decoding of single words (Curtis 1980; Jastak and Jastak 1978; Perfetti and Hogaboam 1975; for a general discussion of this matter, see Gough and Tunmer 1986). We remark on this, only because the Whole Language people so often suggest that Code Emphasis produces children who decode but don't comprehend. It is, of course, true as we have noted earlier, that children who are not adepts of decoding will invest so much time and attention in just getting the word that they will overreach the capacity of the working memory that is essential to processing the sentence (Perfetti and Lesgold 1979). However, this is not a reason for encouraging them to skip or to fill the words in by guessing; rather it is a sign that they need, by practice, to make the decoding process automatic and relatively effortless. Even when children appear to have mastered the words, they may still have trouble with the sentence, not because they have bothered to read words, but because they have a deficiency in the syntactic component of their language faculty, independently of whether the constituent words are spoken or read. Indeed, there is evi-

dence that poor readers do have relatively greater syntactic difficulties than good readers, even when the sentences are spoken to them (Smith et al. 1989), and it is interesting from our point of view that there are some reasons for supposing that such difficulties may, in fact, be traceable to the same phonological deficiencies that underlie the problems with decoding (Shankweiler 1989). Finally, we offer the common-sense observation that comprehension will sometimes be impossible for reasons that have nothing to do with either reading or language ability. Thus, no matter how skillful or linguistically gifted, readers will, for example, not comprehend a paper on a scientific subject in a field utterly foreign to them. But whatever the reasons for failing to understand a text, none of them in any way suggests that the remedy is to teach the reader to guess at the words or to skip them. Given the nature of language, it is simply inconceivable that texts can be understood except by taking account of the words they comprise. Teaching the children what they need to know in order to read those words fluently must be the primary aim of reading instruction. What they need to know, and what their experience with language has not taught them, is no more and no less than the alphabetic principle.

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