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ABSTRACT

Use of the syllable as a unit for initial acquisition of reading is advocated. It is argued that since English alphabetic writing is based on a mapping between sound-stream and symbol, a decoding approach is necessary at early stages of the acquisition process. However, conventional phonics methods confound two very difficult tasks in initial learning: (1) acquiring the notion that the orthography tracks sound directly and meaning only indirectly; and (2) understanding that the alphabetic unit corresponds to the highly abstract phonological unit, or phoneme, which is both difficult to pronounce in isolation and difficult to recognize and blend. On the basis of research in speech perception, it is suggested that syllables are more natural units than phonemes because they are easily pronounceable in isolation and easy to recognize and blend. Introduction to a syllabary will teach children the basic notion of sound-tracking uncontaminated by simultaneous introduction of the difficult and inaccessible phoneme unit. Preliminary evidence that a simple 23-element syllabary can be acquired with ease by inner-city and suburban kindergarteners is presented. In particular, it is shown that this population can blend previously untaught combinations of known syllables to form and comprehend new multisyllabic words. (Author/TO)

Teaching Reading by Use of a Syllabary

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Abstract

Use of the syllable as a unit for initial acquisition of reading is advocated. It is argued that since English alphabetic writing is based on a mapping between sound-stream and symbol, a decoding approach is necessary at early stages of the acquisition process. However, conventional "phonics" methods confound two very difficult tasks in initial learning: (1) acquiring the notion that the orthography tracks sound directly, and meaning only indirectly; and (2) understanding that the alphabetic unit corresponds to the highly abstract phonological unit "phoneme", which is both difficult to pronounce in isolation, and difficult to recognize and "blend". We suggest on the basis of research in speech perception that syllables are more natural units than phonemes, because they are easily pronounceable in isolation and easy to recognize and blend. We claim that introduction to a syllabary will teach children the basic notion of sound-tracking uncontaminated by simultaneous introduction of the difficult and inaccessible phoneme unit. We present preliminary evidence that a simple 23-element syllabary can be acquired with ease by inner-city and suburban kindergartners. In particular, we show that this population can blend previously untaught combinations of known syllables to form and comprehend new multisyllabic words.

Teaching Reading by Use of a Syllabary[1]

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Reading, as has often been remarked, is understanding the relations between squiggles on paper and meanings. The concepts relating the written symbols to meanings obviously differ for different orthographies. We will argue in this paper that the concepts necessary for understanding English alphabetic writing substantially overlap the concepts necessary for understanding syllabic orthographies; and that the acquisition of certain concepts embodied in syllabaries can be of great usefulness for the child who is trying to learn to read English. To clarify the issues here, it will be helpful to outline major concepts that necessarily underlie skill with various kinds of orthographies.

One can to some extent understand pictographic writing systems without knowing the language of those who wrote them: the phonological character of speech events is not represented in these scripts. One must grasp only that the orthography represents meanings and that its signs "look like" the meanings they "stand for"; the sign picture-of-a-man corresponds to the notion man. In advanced logographic systems (approximated by present day Chinese), the pictorial quality is sharply reduced. To understand a pure logographic system, one must learn that

the orthography linearly represents meanings, and that each sign corresponds to a single meaningful word. Neither a pictographic nor a logographic system requires knowledge of the pronunciation of words as a prerequisite to understanding.

For the case of syllabic systems (for example, the Hiragana syllabary in modern Japanese or the ancient Mesopotamian cuneiform), matters are much more complex. The learner must have prior knowledge of pronunciations in the language to be read. As before, he must grasp (a) that the orthography linearly represents meaningful speech. But now he must learn in addition (b) that the signs of the orthography track the sound-stream of speech; (c) that each sign stands for a distinct phonological segment, a syllable; and (d) that these syllabic units are combinable to represent all the multi-syllabic words of the language.

Alphabets, the most analytic writing systems, share the same task demands as syllabaries, with the very important modification that the signs to be learned and blended correspond to highly abstract phonological segments, phonemes.[2]

We ask in this paper which of these features of writing systems pose conceptual burdens that become barriers to reading acquisition. Our findings are that children have little or no difficulty in comprehending the basic principles of logographic systems: they can readily grasp the idea that language can be represented by a sequence of written signs, if the signs correspond directly to meaning.[3] They do have some difficulty with the acquisition of a syllabary; that is, it is

relatively hard to learn the concept of phoneticization (the idea that the sound system mediates the relation between sign and meaning). They have particular difficulty with an alphabetic system; it is especially hard to learn phoneticization at the level that corresponds to alphabetic signs: the phoneme.

The various perceptual-conceptual problems posed by sound-tracking (phoneticization), identifying the appropriate visual-auditory correspondences (phoneme-to-grapheme), and combinability of units (blending) are confounded in phonics oriented approaches to the teaching of reading. The child is introduced to the general notion of phoneticization (sound-stream tracking) with phonemes as the relevant units; he is asked all at once to attend to the sound of language as a cue to meaning, and to learn in particular that the sound-stream can be conceived as a sequence of minimal recombinable phonemic units. (For example, he is to learn that the spoken word bad consists of three "acoustic units", each represented by a letter of the alphabet). Our position is that these tasks, each of which is conceptually difficult, should and can be separated for the learner.

More specifically, we begin with the well-known fact that young children find it hard to analyze and blend phonemes, even though a unit much like the phoneme plays a role in their ordinary perception of speech. If the child cannot become aware of the fact that bid, bug, and banana "start with the same sound", then he cannot come to understand the relevance of the written symbol b in the orthography. But once he can agree that bad consists of the "sounds" b, a, and d, he has

learned the critical factor in decoding writing. Notice that he need not ever have seen print to accomplish this insight. In short, we are claiming that the fundamental conceptual problem in reading acquisition is psychoacoustic: it has to do with awareness of phonological segmentation, and it has very little to do with the writing system itself, i.e., the visual input.

Faced with the relative inaccessibility of the phoneme to consciousness, and lacking a procedure for providing the learner with insight into this notion, we propose to ignore the phonemic unit during the initial stages of teaching. We begin by teaching other fundamental aspects of alphabetic writing. Our approach--an approach, we admit, anticipated by some thousands of years by the Babylonians--is to begin reading instruction with a concrete, more readily accessible phonological unit: the syllable. This strategy is based simply on the fact that it is much easier for a child to learn to combine o and pen into open than to combine buh and ē into be. Only after the basic notions of sound tracking (phoneticization) and recombination of units are grasped through attention to syllables is the child introduced to the phonemic units.

We will not claim that, once these issues have been clarified for the learner, we know how to give him access to phonemic segmentation; no one has any idea of how to do this. We will claim only that we can teach phoneticization by using the syllable as the beginning unit. We will suggest, but we cannot at this stage show conclusively, that the child who understands the gross concept of phoneticization is better

equipped to approach the problem of phonemic segmentation. We describe below the theoretical basis for a syllabic approach to decoding English orthography. We then provide some central characteristics of a syllabic curriculum for initial reading instruction, and the results of preliminary work with this method.

A. The Relation Between Signs and Meanings: Learning to Read Logographs

In a logographic (whole word) writing system, there is a direct relation between sign and meaning, a relation which is not mediated through the sound system. Thus to some extent, at least, one can "read" (get meaning from) a Chinese newspaper without being able to understand the spoken language. The Chinese logograph, unlike a pictograph, is nevertheless abstract in the sense that it is arbitrary--only in rare cases can the sign be interpreted as a direct pictorial representation of the word meaning.

We first asked whether children who have difficulty in learning to read alphabetically could learn to read a logographic system (Rozin, Poritsky and Sotsky, 1971). The answer is yes. With only three to six hours of tutoring, eight second-grade inner-city school children with clear reading disability were taught to read, with fair to good comprehension, English material written as 30 different Chinese characters. (The symbols used were the actual Chinese characters corresponding to the 30 English words chosen). Tutoring each of these subjects in traditional phonics had no discernible effect.[4] Figure 1

shows a story on which these subjects were tested.

Figure 1 Approximately Here

The effect of this study is to eliminate certain general interpretations of reading difficulty as, for example, visual-auditory memory deficits. The results also indicate that under some circumstances, at least, culture and dialect distinctions between teacher and pupil do not seriously impede the child's learning that the spoken language can be represented by arbitrary sequential visual arrays. Here, where there is a direct mapping from written symbol to meaning, there is no acquisitional problem beyond sheer memorizing of the symbols.

Though this study eliminates certain interpretations of the reading problem in the inner city, the implied method ("whole word") is ultimately of little use. The memorization problem rapidly becomes intrusive, probably more so when the units of writing are letter sequences. (It is likely that the unitary quality of the Chinese symbols makes them visually more distinctive than English words.) However, this study serves to reemphasize that the phonological mapping, with its consequent notions of analysis and "blending" of sound segments, is fundamental among the cognitive problems involved in learning to read.

B. Phoneticization

A significant difficulty in learning to read apparently is apprehending that the sound system is to mediate between sign and meaning. That this poses a problem is not surprising since, in the process of

learning to speak and comprehend, the child must have grasped the fact that the relation between sound and meaning is conventional, not inherent; but now he is being asked to attend to just this surface aspect of language: to be aware that rat is like hat and (for these purposes) unlike mouse.

Some children apparently fail to realize that sound is involved at all in the reading task. For example, some second graders will not even recognize a relation between sound length and word length (in letters). In a pilot study of this problem (Rozin, Bressman, Snyder, Taft, and Gleitman, in preparation) we asked children in representative second grade inner city classes to guess which of two written words displayed to them represented a word we spoke to them. Thus a sample question as posed was: "One of these says ASH and one says ASPARAGUS; which one says ASH?" The same question was posed for various word pairs differing greatly in written and spoken length. Some of these subjects often chose incorrectly, and could not articulate the simple principle involved in the choice: "because it's shorter". Yet surely this test asks for just the very weakest grasp of the notion of phoneticization.

A number of studies suggest that children with poor reading prognosis and achievement do not attend to and talk about phonological aspects of the language, though surely they "hear" them (see Dykstra, 1966, for a review of this literature). Tests of the ability to discriminate among similar-sounding words (e.g., the Wepman test) reveal significant differences between good and poor readers (Deutsch, 1964;

Blank, 1968), and can be used with some success to predict reading difficulties (Wepman, 1960; de Hirsch, Jansky, and Langford, 1966). Disadvantaged preschoolers make many more errors than more advantaged children on the Wepman test, even with IQ factored out (Clark and Richards, 1966). Similarly, our own preliminary results suggest that urban kindergartners with a poor prognosis for reading success are less likely than suburban children to use rhyme as a mnemonic aid in paired associate learning. That is, while the meaningful relation of CAT - DOG facilitates memory in both groups, the phonological relationship HOUSE - MOUSE is a much more effective mnemonic for suburban kindergartners.

In some further detail, we presented kindergartners with pairs that rhymed, pairs that had an obvious meaning relation, and pairs that had no relation. Rhyme and meaning facilitated memory for both urban and suburban populations, but the rhyme relation was significantly more useful to the suburban children. Even more striking was the pattern of rhyme intrusion when the subject erred. More than two-thirds of the suburban children proposed a rhyming word or nonsense form on at least one occasion when they could not remember the right answer. Fewer than one-third of the urban children ever produced a rhyme intrusion.

These studies do not imply that the poor reader cannot discriminate phonological features of his language. There is much evidence indicating that he makes these discriminations perfectly well in speech and understanding, but nevertheless he cannot follow instructions to

discriminate among words on the basis of their sound properties alone. Blank (1968) reports that when poor readers whose performance on the Wepman test is inferior are asked simply to repeat the words on the test, they do so quite reliably. Thus while these children use phonological information adequately to discriminate among words in speech and comprehension, they do not notice these phonological properties outside the context of ongoing speech; at least some aspect of the sound system is inaccessible to reflection. This demonstration that a particular ability may be found in one context but not in another may be a further example of what Rozin and Kalat (1971; 1972) have called "tightly wired capacities", or "adaptive specializations"; in man, certain aspects of language are likely candidates for such specificity. (See, for a more general discussion of children's awareness of their linguistic knowledge, Gleitman, Gleitman, and Shipley, 1971).

Why is it so hard to teach the alphabetic concept? Is it the case that phoneticization, at any level, is equally inaccessible to children with reading difficulty? Our view (shared by many investigators, see especially Savin, 1971), is that the phonological unit on which the alphabet is based (the phoneme) is particularly difficult. Although there is reason to believe that alphabetic units correspond to a coherent level of language processing (i.e., the invention of the alphabet, the effect of tongue-twisters on non-readers, and the use of rhyme and alliteration in pre-literate poetry; see Bever, 1970), this level seems to be difficult to apprehend conceptually, manipulate independently, or talk about.

For concreteness, consider the problem of telling a child what feature(s) of the spoken language is represented by the letter P. It is impossible even to instantiate the entity without adding a vowel (thus, "puh"), for it is in the nature of the speech mechanisms that we cannot pronounce stop consonants outside the context of a whole syllable. The child must somehow discern that in the instance "puh" the "uh" was an artifact, and only the "p" was intended. To get this obscure point across, we try such tricks as saying "puh-ah-tuh, now-say-it-very-fast, pat". But "puh-ah-tuh", regardless of speed, never will sound like pat. These phonological units are in no physical sense independent bits of sound that can be strung together; they are perceptual and conceptual units and they appear in speech encoded onto syllable length segments. Certainly many children learn to "blend" letter sounds, but when they do so they have already cracked the reading problem. When the teacher says "sound it out" she is merely saying "know how to read". As the phoneme is the gross unit of alphabetic writing, it is not surprising that some people don't learn to read; it is amazing that so many do.

The very important work of Liberman and his colleagues in speech perception (e.g., Liberman, Cooper, Shankweiler and Studdert-Kennedy, 1967; Liberman, 1970) indicates the nature of some of these problems. First, many consonant phonemes are unpronounceable in isolation. Consider, for example, the phoneme "d" as represented in the syllable "di" (Figure 2). The vowel sound "i" is represented essentially by the relationship of the two steady-state frequencies (first two formants).

he would then be inclined to assign "d" to the two ascending transients over the first 50 milliseconds. However, while the two formants alone would sound like "i", the transients alone sound like a chirp, rather than a speech sound. Put another way, if a taped "di" is clipped in an attempt to isolate the "d" segment, it will go abruptly from a "di" to a chirp; there is no isolatable "d" in the sound stream. Second, many consonant sounds are context dependent. Only recently have Liberman and his colleagues been able to describe the invariant properties of the sounds we hear as "d" (see Figure 2 for two examples of configurations perceived as "d"). Articulatory changes corresponding to phoneme shift are affected by surrounding phonological context, so that what may be a well-defined unit at some point in the nervous system is "shingled" with neighboring units in the sound stream (see Figure 3). Syllables retain their identity in the sound stream to a much greater extent than phonemes.

Figures 2 and 3 Approximately Here

Note that the issue for our purposes is not whether a phoneme identification and generation machinery exists in the brain (clearly it must), but rather whether it is accessible to reflection, and if so, at what ages and under what conditions. Some evidence from speech perception and production suggests at minimum that the phonemic level of phonological representation is not the most readily accessible one. For example, Savin and Bever (1970) and Warren (1971) report that adults are able to identify syllabic targets more rapidly than single

phoneme targets. The comparative difficulty of phonemic analysis is probably even more pronounced in childhood. The six-year-old who is beginning reading instruction may not have a fully developed phonemic organization (even implicit) of his language. Markova (1969) has shown that a Russian pre-schooler's ability to reproduce the syllabic framework of a word is significantly ahead of his ability to do so without internal phonemic distortions.

We have conducted some preliminary tests (Allen, Rozin and Gleitman, in preparation) to see whether syllabic or phonemic segmentation is more accessible to the pre-reader. Our subjects were kindergartners (both urban children and suburban children) who had had no formal reading instruction. We played a tape for them on which "a funny lady speaks very slowly". We asked them to guess the words she was saying, and to select the object described from a set of objects arrayed in front of them. The stimuli were simple bisyllabic words divided either into first letter-sound and the remainder (e.g., PUH - 'APER; MMM - 'ONKEY) or into first and second syllable ('PA - PER; 'MON - KEY); in both cases, word stress was preserved. The results indicate that the naive pre-reader is more capable of recognizing a meaningful word when it is segmented syllabically then when it is segmented phonemically. Similar results have been reported by Brown (1971) who showed that children in the age range 46 - 80 months found blending of two syllables easier than blending two phonemes.

Some cross-cultural and historical evidence is also suggestive. At least seven ancient societies independently invented syllabary nota-

tions, and there are some modern instances (of particular interest is the invention of a syllabary by the Cherokee Indian, Sequoyah; see, e.g., Gelb, 1952). In contrast, to the best of our knowledge, an alphabetic system was invented only once, and even this once not by a clear and exhaustive insight into the phonemic notion: development of a full alphabet marking vowels as well as consonants took hundreds of years (Kroeber, 1948). Further, there is a suggestion that syllabaries are easier to learn as well as easier to invent. In Japan, where the orthography consists of a syllabary plus logographs, there is reported to be a very low rate of illiteracy (Makita, 1968); and in fact a great many Japanese children pick up the syllabic component of the system before formal schooling begins (Sakamoto and Makita, 1972). Walker (1969) reports that "the Cherokee were 90% literate in their native language in the 1830's", using the Sequoyah syllabary, and that "by the 1880's the Western Cherokee had a higher English literacy than the white populations of either Texas or Arkansas." Taken together, this evidence bolsters the suggestion that the syllable is a natural unit for representation in an orthography.

Perhaps most convincingly, the fluent reader of English apparently dispenses with analysis below this level, even for unknown words. Try, for example, to pronounce the (new) word robatilific. Note that you do not "blend" r + o, but rather deal with the unit ro, though indeed you may try two different syllables that could be represented by ro (i.e., row and rah). Given that this is one outcome of learning to read English fluently, it would be no conceptual loss if all that was

learned was the set of syllables and a partial scheme for segmentation into these units.[5]

C. A Syllabary as an Introduction to Phoneticization

We have claimed that serious conceptual problems in learning to read an alphabet are (1) to focus on the sound stream; (2) to recognize and consciously apprehend the phoneme as unit; and (3) to blend and analyze in terms of this unit. We do not know how to teach children to do (2) and (3). We propose instead to teach them the syllable unit, and how to blend it.

A major problem for this approach, of course, is that English has a complex syllable structure with consonant clusters both initially and terminally: thus there are some thousands of separate syllables to be learned and, given the vicissitudes of conventional spelling, there are even more than there need be. Historically, successful syllabaries have been developed for languages with a simple consonant-vowel syllable structure. (For example, the 47 elements of the Japanese Katakana syllabary are sufficient with a few supplementary "marks" to represent all utterances in Japanese). We have already noted that many children have difficulty learning the 26 alphabet signs. It is not our plan to substitute thousands of syllable signs. The point of the syllabary approach is to dissect the conceptual problems of alphabetic reading for the child, rather than presenting all of them together, as is usually done:

(a) we first show the child that the relation between sound and meaning can be represented visually; we do this with sequences

of pictographs;

(b) we introduce the child to a syllabic segmentation of normal English orthography, using both the monosyllabic pictographs of (a) and some further syllables written as arrays of English letters;

(c) employing a rebus approach, we show the child that these syllabic units can be combined on the basis of their sound values to yield further meaningful words, thus emphasizing that the orthography tracks the sound system; and

(d) very much later, we will try to show him that the abstract unit represented by the alphabetic sign is an efficient mnemonic for the inconveniently large set of syllables.

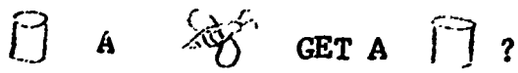
To make these issues more concrete, we now describe the results of teaching some children to read a simple syllabary.

For pilot testing, we chose six middle-class children from a suburban school, and six from an inner-city school. All subjects were in their second semester of kindergarten. A pre-test showed that none of them knew how to read.[6] There was much informality in the procedure, but in essence the method was as detailed below.

1. Speaking "slowly": We began instruction by playing a game in which we broke words into syllables with approximately a 1 - 1 1/2 second interval between syllables. The children were to "guess" what we said; also the children were asked to do the same, asking the experimenter to guess. While this task was not instantly obvious to all children, a few minutes' instruction sufficed to bring most to a fair

level of comprehension.

2. Pictorial symbols: The child was next shown pictures of about six meaningful words that were single syllables (elements of the syllabary are shown in Table 1), for example, <u>can</u> (a tin can), <u>bee</u> (a bumble-bee), <u>O</u> (the letter O). The child was asked to "read" the picture; if he guessed wrong, we told him the answer. Learning these symbols took only a few minutes. The cards were then placed in a row, and the child was asked to read the resulting "sentence"; e.g.,:



CAN A BEE GET A CAN ?

Again, learning was quite rapid. Note particularly that the first sense of <u>can</u> (as the auxiliary verb) caused no difficulty. Thus, the rebus principle itself is apparently quite natural and requires no special training (<u>see</u> also Woodcock, 1968). Up to this point, the method resembles the Peabody Rebus Method (Woodcock, Clark and Davies, 1968). However, our syllabary approach differs fundamentally from the Peabody Rebus Method in its essential focus: the construction of new words from their syllabic-phonological components.

3. Combining syllables: After about 15 separate symbols had been taught, and the child could read (and sometimes create, and "write" using cards with syllables on them) a number of sentences, he was told that overlapping cards represented a single word. This blending principle was most easily introduced by beginning with items whose morphology was preserved under the combination (thus <u>fire-man</u>, <u>cow-boy</u> were

better introductory materials than can-dy, be-fore). Half an hour of training was generally sufficient for the child to recognize and name previously unseen combinations of previously known symbols (e.g., o-pen, sill-y, wind-o, wind-o-sill). Bear in mind that most of the symbols were at this point pictures. Some, however, were ordinary arrays of English letters; e.g., our representation of the syllable er (which can hardly be pictured) was just ER. Thus at this stage the reading was done in a half-English, half-pictograph, syllabic format.

We now attempted to develop procedures for testing what these children had learned. The major question is whether they could pronounce and understand syllabic blends that they had never seen before; this would point to acquisition of a productive system for deriving new words on the basis of acoustic relations. We already knew that the urban group had failed to learn this principle at the phonemic level, and that the suburban group had not been exposed to it in school.

We wrote two little books which used the symbols the children had learned, including new blends that they had never before seen or read (a sample is shown in Figure 4). Two urban children and six suburban children were shown these books after a maximum of five hours of instruction in the syllabary. All were able to read the books, including all or most of the previously unknown blends (e.g., wind-o-sill, pen-sill).

Figure 4 Approximately Here

At this point some doubt arose over the objectivity of the test

method. The evidence was merely our own definite impression that the books were read "with normal intonation", and that informal questions were responded to appropriately. But one might well ask whether these children really "understood" the blends that they could readily pronounce, and how much of the information was provided by the pictures. We therefore developed a test that included a comprehension measure. Five inner-city children were taught 22 syllables and 16 combinations of these (e.g., puppet, before, open, see Table 1). Testing took place after the notion of combination (blending) appeared to be acquired, but before all picture-symbols were replaced by letter arrays (five to seven hours of instruction).

Table 1 Approximately Here

Each child was now told that "a new game" was to be played. A set of objects and pictures (a can, a penny, candy, etc.) were arrayed in front of him, and he was asked to name each of them. If he did not give the target name (e.g., if he said window when shown the picture we called icy window) we provided the target name (i.e., we said "It's an icy window, isn't it?"). Twelve commands, written in the syllabic orthography were now presented to the child one by one. The commands contained both syllable blends that he had already learned (e.g., puppet) and some that he had not learned (icy, can-opener, pencil, candy). The child was asked to read the command aloud and then to "do it". The full list of commands appears in Table 2.

Table 2 Approximately Here

The responses were scored as correct only if the child carried out the instruction precisely by picking out the right object(s) in the right order. With a bit of coaxing, all five subjects read the commands satisfactorily. All were able to understand blends, including previously unseen ones, well enough to carry out most of the instructions, although only two of the subjects responded errorlessly. Table 2 shows the number of correct responses: an average of 10.2 correct out of a possible 12.

To control for guessing, we selected three more children at random from the inner-city population. These subjects were given 15 to 30 minutes training in the syllabary program. In this time, we told them the names of the syllable cards, both pictures and letter arrays, as well as the convention (overlap of cards) for blends, and we gave them some practice sentences to read. We also told them the target name of each test object and picture, and then administered the test. We reminded them of the names of all cards used in each command just prior to presenting it (though, in fact, these three children had learned almost all of the (mostly pictorial) syllable names perfectly well in this brief period of time).

The results are shown in the last column of Table 2. As the table indicates, all of the control subjects obeyed the first command, GET A CAN, which is the only one that contains no blends. This fact indicates that these subjects understood the instructions. However, when faced with the other commands, all of which contain blends, they were at a loss: they responded to GET A CANDY no differently than to

GET A CAN. We can conclude that the success of the experimental subjects was not the result of guessing on the basis of partial information. Blending was required for success.

In sum, after five to seven hours of instruction, twelve kindergarten children learned to recognize the meaning of new words on the basis of their phonological relation to known words. All were consistently enthusiastic about these newfound abilities. The results suggest that the principle of syllabic reading can be taught to inner-city kindergartners, without tears, in a brief span of time.

D. A Syllabic Curriculum

We have so far argued that the syllabary approach has some theoretical merit, given what little we know of the reading process; and we have given a preliminary demonstration of its accessibility. Of course it is a far cry from such demonstrations to the design and evaluation of a practical curriculum based on these concepts. Currently we are designing a base syllabic curriculum and submitting it to preliminary evaluation with kindergarten classes in the Philadelphia area. We cannot describe this curriculum in detail in a brief paper, but a few points are worth making here.

We have extended the syllabary to include 60 syllables. (A sample of writing in the new syllabary appears in Figure 5). This facilitates the creation of reasonably interesting prose material. Many of the pseudo-spellings used in the demonstration project described above have been eliminated (e.g., we no longer use "C" as the spelling of <u>see</u>).

Figure 5 Approximately Here

The choice of syllable types for initial instruction incorporates a number of relevant principles. Syllables that readily combine with each other are useful in increasing initial reading vocabulary while keeping the memory burden relatively light; easily picturable syllables are useful on the same grounds. An effort has also been made to introduce syllables that represent the most common English words at an early stage, so that the stories will not be awkward in style. At the same time, meaningless syllables (e.g., ER as in butter) are helpful in pointing the distinction between semantic unit and phonological unit. As we will discuss in further detail later, a number of syllables have been chosen with an eye to possible devices for effecting a transition to phonemic concepts (e.g., syllables that rhyme, syllables that are subject to more than one phonemic segmentation--e.g., CAN-DY versus CAND-Y--and syllables that represent basic spelling patterns, such as ING and ALL).

One crucial issue deserves more detailed comment here: how is the syllabary program to cope with the apparent irregularity of English spelling? A syllabic approach, like a phonics approach, begins by getting the child to notice certain obvious correlations between written symbols and pronunciations. This introduces the child to the notion that the orthography tracks the sound stream. In very many cases, there are direct and regular relations between syllable-spellings and syllable-pronunciations (just as there are very many direct and regular

relations between phoneme-spellings and phoneme-pronunciations in English); just these "good" or "simple" cases are chosen for initial study. Yet we know that these simple correspondences will in the long run be insufficient for complete understanding of the orthography. The child must eventually become aware that there are sometimes alternative spellings for the same pronunciations, and sometimes same spellings for different pronunciations. Fundamentally different reading programs will emerge depending on one's view of the status of these exceptions to phoneme-grapheme or syllable-grapheme correspondence. If one takes the view that these exceptions are frequent, idiosyncratic, and capricious, a whole-word approach will emerge (i.e., one will take the view that symbol-pronunciation correspondences are a poor conceptual basis for reading). If one takes the view that these exceptions are themselves regular (i.e., that they embody further principles of symbol-pronunciation correspondence) and/or that they are infrequent, a complex phonologically oriented curriculum will emerge.

C. Chomsky (1970) and N. Chomsky (1970) have recently claimed that much of the "irregularity" of English spelling can be reinterpreted if one takes the orthography as representing "deep phonological segments" rather than surface phonetics. Cases in which the correlation of pronunciations and written symbols seem direct are then said to be cases in which the deep and surface phonology happen to be close. The Chomskys believe that, while these simple cases serve to provide the child with an initial hypothesis for decoding, the more complex instances that he eventually encounters will require him to change his

first hypothesis, to recognize that the orthography represents deep phonology.

Without taking a stand on the issue of how far the concept of deep phonological representation can rationalize present-day English spelling, we can clearly agree that some of the variability in the way phonemes and syllables are written is itself regular under some general rule; for example, doubling the final consonant before Y (sunny, funny), ER (butter, litter), LE (little, settle), and ING (sitting, running). We introduce these rule-determined spelling variants early in the syllabary program to help the child become aware that often the same syllable is spelled in different ways. For example, some of the SUN syllable materials say SUN and some say SUNN. In principle, at least, the teacher is always to choose the correct card, given the spelling pattern (i.e., she selects SUN in isolation, but she selects SUNN if she is constructing SUNNY). It is possible that only a few examples of such complex spelling patterns need to be taught explicitly. If not, then any syllabary--or phonics--program will have to give explicit training for each complex orthographic principle.

Whatever the outcome here, all of our current knowledge about the English writing system suggests that there will be a significant residue of true irregularity in the relations of written symbols to pronunciations (e.g., get, toe, tow, ghet-to). As in any sound-stream oriented program, we avoid early introduction of most such idiosyncratic representations--simply by avoiding these words--until general principles have been established for the learner. Any reasonable pro-

gram will make their exceptional status clear to the learner, and will order their introduction in terms of their frequency of usage.

E. Back to the Phoneme

We believe that the child should be taught the phonemic principle, if this is possible; the syllabary is, ideally, an introductory system whose purpose is to make phonics more accessible. We will describe, in this section, the ways that the syllabary may be helpful in this regard. First, however, we must make plain why we think the syllabary alone will not serve as the sole device for learning to read English (why, in other words, the alphabet was invented).

It was asserted earlier (see Section B) that adults recognize thousands of syllables and whole words as units, and that they characteristically analyze unfamiliar words in terms of syllabic rather than phonemic chunks. For fluent readers, the alphabetic principle may serve primarily as a mnemonic on the set of syllables, and may be used only very occasionally. Fluent reading is not a process of blending--or even looking at--sequences of individual letters. These facts might suggest that syllables are all one "need know" in order to learn to read. This view is probably false: the problem in learning to read by use of syllables is that there are too many of them.

Several thousand syllables occur in English. Given the efficiency of the alphabet in reducing the memorial problem in learning almost to zero, it is inescapable that this principle ought to be taught. We do not believe, then, that a large number of whole syllables ought to be taught to the beginning reader (except in remedial cases; see Section

E3 below). But we do believe that a coherent phonemic program will grow naturally out of initial syllabic instruction. A precise account of this claim awaits much more extensive empirical investigation, but some general possibilities can be described now.

We have so far given preliminary evidence that the rebus-syllabic system is itself learnable, even by populations that have not shown significant progress with traditional methods. We will now try to show how this accomplishment may be useful for further reading instruction. We discuss three possible approaches:

1. The syllabary as an introduction to an explicit phonemic program

Most children finally apprehend the phonemic concept: that "buh-ah-tuh" spells bat. We do not know how they learn this. We know of no evidence supporting the view that phonics methods succeed because they provide direct information about alphabet to phoneme correspondences. For all we know, the capacity to manipulate these units is a consequence of knowing how to read, not a method for teaching it.

How can this be? There is strong evidence supporting sound-stream oriented approaches over whole word approaches. For example, Chall (1967) concludes, on the basis of an extensive review of the reading literature, that methods lacking a strong phonic component are on the whole less successful. Apparently, explicit information about phonology helps most learners. But this evidence is not precise enough to be interpreted as supporting use of the phonemic unit as the first step. In this context, both Chall (ibid.) and Dykstra (1966)

report that the particular approach taken to phonic instruction evidently does not strongly affect the chances of successful learning. The evidence shows only that a phonologically oriented method has advantages over a meaning oriented method in giving the child the idea. Whether use of a simpler phonological unit for initial instruction would be helpful is unknown. It is possible that the child induces the notion of the phoneme from partial syllabic learning, even when this is not what the teacher thinks he is teaching. It is quite conceivable that in the process of acquiring a limited syllabary, with its concepts of phoneticization and blending, the learner has been well prepared to understand the phonemic principle: to learn phonics faster and more easily.

Since we cannot know how much of what is learned about reading is a consequence of what is explicitly taught about reading, it pays to build into the syllabary program as much as possible that will display phonemic principles to the learner, and to give whatever explicit hints seem likely to be helpful. There is no way to tell how much must be done for each child before he gets the idea; obviously, this will differ enormously for different children. Overall, though, the following criteria for selection of initial syllabary materials give promise for helping the child to achieve the transition from syllable to phoneme; the relative effectiveness of teaching based on these aspects of the initial syllabary are now under test in the schools:

a. initial choice of continuant consonants: Notice that with continuant consonants (e.g., s, f, m) we can avoid the artifactual

introduction of the "uh" that accompanies instantiation of the stop consonants (e.g., p, d, k). Thus it seems appropriate to introduce the continuant consonants first during the phoneme transfer stage. This is simply a further application of the principle of speech perception that we outlined earlier (Liberman et al, 1967).[8] We have had some success in pilot work, teaching inner-city children to blend initial s following syllabary training.

b. morphophonemic transfer: We have found in pilot work that it is comparatively easy to introduce the plural s merely by saying: "If you want to say more than one of them, you have to add the s-card". The child would now pronounce pup + s as pups without any further instruction, and to our gratification, can + s as canz. (Somewhat to our horror, most of the pilot subjects now promptly pronounced child + s as children).

c. analysis of medial letter-phonemes through alternative syllabic representations: A few subjects were shown that the same word could be represented syllabically in two ways; for example, can/dy, and cand/y; And/y and And/dy. The child would generally claim that whichever way he had learned first was "right", but he could nevertheless recognize and read the word in both forms. We may be able to use alternative representations of this sort to teach the underlying analytic concept: many of the syllable elements can be "taken apart". The last segment of the (previously unitary) element cand in cand-y also serves as the first segment of the (previously unitary) element dy in can-dy. In this fashion the child may be able to abstract the letter-phoneme "atom" out of the syllable "molecule".

d. rhyme and alliteration (the linguistic method): (e.g., and, sand, cand, hand). This method is self-explanatory. Our prior work indicates that the inner-city child may not respond to this method initially. However, since syllabary training will have introduced him to the notions of (1) tracking the sound system, and (2) blending phonological entities, we are hopeful that he will find rhyme and alliterative relations more accessible when they are introduced at this later stage.

2. Spontaneous induction of phonemic principles from the syllabary base

Some phonemic principles may be induced spontaneously from the syllabic base, thus minimizing the amount of explicit phonemic instruction that will be necessary.

It is obvious that spontaneous induction of phonological principles is part of the normal reading-acquisition process. Widespread anecdotal evidence suggests that some children discover the phonemic basis of reading before entering school and without formal instruction (see also Read, 1971). Many children taught only whole words arrive at phonological principles nevertheless (Chall, 1967; Gibson, 1965). More important: phonics instruction or no, much of what we have come to know about decoding unfamiliar words is constructed without explicit teaching. Many examples come to mind: the fluent American reader without foreign language background automatically and inspite of most earnest correction will read our names as GLEET-man and ROZE-en; all those who read our nonsense-word, ROBATALIFIC, (see Section B), place

the primary stress ("accent") on the syllable LI, and very probably the secondary stress on the syllable BA; most will remember words like 'MIZ-ZILLED (misled) and 'E-PI-TOME (epitome) in their childhood reading vocabularies. All of these "errors" point to well-assimilated rules of speaking and reading that never were explicitly taught. Spontaneous induction of "atomic" phonemic principles from the syllabary "molecules" we teach would thus not be surprising.

In sum: we do not know how little must be taught of decoding principles to teach a child to read. The history of reading research tells us only that some explicit information concerning principles of phoneticization (gross sound-stream tracking) are helpful to the learner. The many examples above suggest only a few of the complex rules used in reading that then usually follow without instruction. Thus syllabics may be almost enough to teach, if the learning of phonemics is the desired outcome; maybe all the child needs is a rough cue to the notion that the orthography maps the phonology. (This is likely because in truth there is only a rough relation between pronunciations and the orthography). In that case, syllables have the advantage of being more readily learnable.

3. A pure syllabary as a remedial system

We now consider the possibility that syllabic instruction may not transfer to the phonemic notions. In that case, would our system be without value? Quite the contrary: the clearest advantage of the syllabary may be for the child who finds phonemic notions particularly intractable.

Many children learn next to nothing about phoneticization, under present instructional techniques. A sufficient demonstration of this is the outcome of the ASH/ASPARAGUS test, as described in Section B. Despite phonics instruction, some children seem to have acquired merely a sight-vocabulary of some whole words, after tedious years of schooling. The American school experience suggests that this problem may persist to adulthood. Some children end up at what is called "the fourth grade level" in reading skill, with a vocabulary of at best a few thousand words. But this is exactly what we would expect as the outcome of learning a logographic system: there is a slow accretion of items and, in the absence of overriding motivation, a diminishing return as the number of items increases.

We have provided preliminary evidence that children with poor reading prognosis can at least learn the syllabic phonological principle (at five years of age). Suppose that, despite this achievement, this group fails to acquire the phonemic concept by any methods that anyone can think of. We should then ask: what are they learning in the school room? And, of course, the answer is: some hundreds or thousands of whole words--a sight vocabulary. But it is self-evident, in that case, that continued syllabary instruction will be most efficient for this group. By the syllabic method, the list of readable words accelerates increasingly faster than the number of syllables memorized. Thus for remedial purposes, at least, a comprehensive syllabary program looks inviting.

Our heuristic in our kindergarten programs (for all population

groups) has been to probe at intervals for signs of emerging phonemic concepts. When we do not find them, we retreat before the child is made aware of failure; we teach him more syllables. This method seems to us reasonable, for (1) we believe the syllabic notions will aid in eventual transfer to phonemics, and (2) this failing, the child is building a stock of syllables that will enlarge his reading vocabulary far beyond the number of syllables learned.

F. Conclusions and Directions

We have asserted that two critical cognitive problems normally are confounded in reading instruction. The first is learning that English orthography directly maps sound rather than meaning, and the second is learning that our orthographic units correspond to highly abstract and inaccessible phonological segments. We have argued on theoretical grounds, and with some preliminary supporting results, that these two problems can be separated; and that when they are so separated the first task can be solved even by very young inner-city children. The barrier to acquisition of alphabetic units appears to be purely psychoacoustic: the child has difficulty in segmenting the sound stream into phonemic chunks, and therefore cannot map the discrete alphabetic units onto equivalently discrete speech units. The difficulty of this mapping is clear theoretically. There is no known practical procedure for solving it for the child, nor is there any adequate theoretical position that points to such a procedure.

This theoretical and practical ignorance has, from time to time, led to madcap fashions in education: if "decoding" of the phonological

symbols is puzzling to describe and difficult to teach, perhaps it doesn't matter: "Decoding is not reading". "Children should be taught to read for meaning." These statements ignore the fact that the child already knows how to extract meaning from the sound stream. Reading, at the elementary level, simply gives him access to another route to the sound stream. It is only during a brief transition period that children with basic decoding skills cannot understand a passage as they pronounce it. Teaching the child "meaning" as part of teaching him to read is thus a red herring. On the contrary, teaching him to decode is teaching him a major essential of reading.

In the absence of a coherent theoretical description of the decoding process and its mechanics, the only question askable is a practical one: is one known method or another more likely to help more children become fluent readers. Of course one cannot be sanguine even about the chances of answering this practical question. So many accidents and variables enter into the school situation that it becomes almost impossible to dissect out the effects of the teaching method. Worse: anyone who invents a new method seems to discover that this technique works better than whatever control method he uses--but only for him, in his own evaluation study. Such facts are depressing, especially because they have sometimes been taken to lend credence to the view that there <u>are</u> no better or worse ways to teach children to read--a <u>non sequitur</u> that currently is having palpable effects both on reading research and on the design of practical curricula.

Proposals for an "eclectic" approach to reading instruction should

of course not be interpreted as abandonment of the search for principles. Given that reading English orthography requires linguistic activities at various levels (of morphology and syntax as well as phonology) and various cognitive and perceptual integrations, it may very well follow that instruction in any or all of these will be fruitful. But one should surely not conclude from this that there are no stateable methods for solving sub-aspects of the general reading task (such as phonological decoding). Our findings thus far suggest that syllabary instruction can usefully be incorporated into eclectic initial reading programs.

Whatever one's views on the general issue of how divergent methods are to be evaluated, one further point must be emphasized: the syllabary proposal is not simply yet another addition to the many hundreds of methods for teaching reading that have been put forward in the last decades. Essentially, only three methods have ever been proposed: learning whole words, learning phoneme-alphabet correspondences, and the linguistic method, in which phonemes are blended onto "spelling units" (syllables), rather than onto other phonemic units. Further distinctions among methods are either matters of detail (which words or which phonemes first, and the like) or matters independent of the crucial "decoding" task (such as motivational techniques; introduction of related concepts, including aspects of meaning, etc.). In short, the syllabary must be thought of as the fourth--not the 400th--possibility for a method of teaching children how to decipher writing into meaning.

In our view, there is clear merit in attempting to develop a cur-

riculum for reading instruction that has a reasonable theoretical basis, that seems effective in a practical school situation, and that has hope of giving the child some insight into aspects of his own language use. Our working assumption is that the syllabary method is a promising introduction to reading, and that after some success with this concept the child will gain access to the letter-sound concept. Once the child acquires the more consciously accessible syllabic system and its overall structure, he may perhaps more easily bring to bear his considerable linguistic skills in solving the puzzling alphabetic notions. Our approach is to ease this process by, as it were, recapitulating the historical development of writing in the process of teaching it: we begin (as did early Man) with pictorial representations, and proceed by steps to rebus and syllable before introducing the highly analytic alphabetic notation.

Footnotes

1. We wish to thank Henry Gleitman, whose substantive and methodological contributions to this work were enormous at every stage, and who also gave us critical readings of the manuscript. A number of our research associates and students should be thanked for moving the ideas forward, as well as for conducting the various studies. In particular, we thank Margaret Allen, Jean-Marie Barch, Beth Bressman, Judy Buchanan, Barbara Chaddock and Muffy Siegel for their contributions. We thank Elizabeth Rozin for comments on the manuscript. NSF Grant #GB 8013 and NIH Grant #MH 20041 supported this research. Paul Rozin was a visiting fellow at Battelle Seattle Research Center during part of the preparation of this manuscript. We thank administrators and teachers in the Philadelphia and Lower Merion school systems for their cooperation.

2. There is currently much controversy concerning the status of the unit phoneme, as described within traditional linguistics (e.g., Hockett, 1958; Harris, 1951). This hypothetical perceptual-cognitive unit bears only a superficial relationship to the notion phonological segment, as described by Chomsky and Halle (1968) and Chomsky (1970). This controversy is only marginally relevant to our purposes in this paper. We use the term phoneme as a descriptive convenience. We take no stand as to its exact description, nor as to its place in a generative theory of language.

3. This claim is one of principle only. In practice, there is some real difficulty for many children in learning correspondences, either

of symbol to word, or of symbol to sound, in English. Part of this problem clearly is attributable to the sheer memory burden that arises if the symbols are not direct pictorial representations of their meanings, and part of the problem may have to do with visual characteristics of the symbols and confusions between and within the sets of sounds and symbols.

4. The results of this study may be interpreted differently. These subjects had already experienced failure with learning to read alphabetically, and thus the Chinese characters had the advantage of novelty; more phonics tutoring, on the other hand, could not be expected to share this advantage, and was undertaken only to determine whether the "one-to-one" aspect of the training sessions accounted for the outcome. One might ask, though, why these children failed to learn to read alphabetically in the first grade, when that situation was novel.

5. This last argument is in some ways peculiar, for it can be said with at least as much truth that the fluent reader ordinarily reads whole words, even whole phrases (Hochberg, 1970; Levin, 1970); yet we do not advocate teaching reading logographically. The sound substratum is clearly the perceptual-cognitive cue to learning the system even though some of these particulate cues are bypassed by the expert, who undoubtedly refers to them fully only for occasional unlearned arrays.

6. The inner-city children had received eight months of instruction with a phonics method (the BRL Sullivan Method, 1968) though with little success. The "best readers" among this group could read words they had been taught (e.g., PIT, TIP), but they were unable to give an interpre-

tation to a new array such as PIP. Thus, their success with known arrays represented merely rote incantation, and did not demonstrate acquisition of the fundamental alphabetic principles.

7. Before testing began, the suburban group was taught the "real" English representations for all symbols (i.e.,  was replaced by CAN). Often, however, we stuck to a simplified spelling system, avoiding the least systematic peculiarities of conventional orthography (e.g., pencil was spelled PEN-SILL, equivalently to the syllable of SILL-Y). Somewhat surprisingly, the shift to letter arrays presented no great memorial problem. (Later work has shown, however, that the memorial task becomes burdensome for some children; see Section E for further discussion). Time limitations made this switch impossible with the urban group.

8. Coleman (1971) has recently evaluated the ease of learning various letter-phoneme correspondences and phoneme blends. As we did, he concludes that children find the sibilants (s, z, sh) and long vowels easiest to learn, these being the most pronounceable phonemes. However, in consonant-vowel syllables, while the consonant easiest to blend is a continuant (z), many of the easy blending consonants are relatively unpronounceable (e.g., b, k, p). At this time, we cannot reconcile these results with our findings or the facts of speech perception.

Bibliography

Allen, M.W., P. Rozin, and L.R. Gleitman, "A test of the blending abilities of kindergarten children using syllable and phoneme segements," (in preparation).

Baratz, J.C. and R.W. Shuy, Teaching Black Children to Read. Washington, D.C.: Center for Applied Linguistics, 1969.

Behavioral Research Laboratories, Sullivan Associates Program, New York: McGraw-Hill, 1968.

Bever, T.G., "The influence of speech performance on linguistic structure," in Flores d'Arcais, G.B., and W.J.M. Levelt, (eds.) Advances in Psycholinguistics, North Holland Pub. Co., 1970, pp. 4-28.

Bland, M., S. Weider and W.H. Bridger, "Verbal deficiencies in abstract thinking in early reading retardation," Amer. J. Orthopsychiat., 38: 823-834, 1968.

Blank, M., "Cognitive processes in auditory discrimination in normal and retarded readers," Child. Devel., 39: 1091-1101, 1968.

Brown, D.L., "Some linguistic dimensions in auditory blending," in Green, F., (ed.), Reading: The Right to Participate, 20th Yearbook of the National Reading Conference. Milwaukee: Marquette Univ. Press, 1971, pp. 227-236.

Chall, J.S., Learning to Read: The Great Debate. New York: McGraw-Hill, 1967.

Chomsky, C., "Reading, writing and phonology," Harvard Educ. Rev., 40: 287-309, 1970.

Chomsky, N., "Phonology and reading," in Levin, H. and J. Williams,

(eds.), Basic Studies on Reading. New York: Basic Books, 1970, pp. 3-18.

Chomsky, N. and M. Halle, The Sound Patterns of English. New York: Harper and Row, 1968.

Clark, A.D. and C.J. Ric ards, "Auditory discrimination among economically disadvantaged and nondisadvantaged school children," Exceptional Children, 33: 259-262, 1966.

Coleman, E.B., "Collecting a data base for a reading technology," J. of Educ. Psychol., 61: 1-23, 1970.

de Hirsch, K., J.J. Jansky and W.S. Langford, Predicting Reading Failure: A Preliminary Study. New York: Harper and Row, 1966.

Deutsch, C.P., "Auditory discrimination and learning: social factors," Merr.-Palm. Quart of Behav. and Devel., 10: 277-296, 1964.

Dykstra, R., "Auditory discrimination abilities and beginning reading achievement," Read. Res. Quart., 1: 5-34, 1966.

Forrester, W.E. and D.J. King, "Effects of semantic and acoustic relatedness on free recall and clustering," J. Exp. Psychol., 88: 16-19, 1971.

Gelb, I.J., A Study of Writing. Chicago: Univ. of Chicago Press,1952.

Gibson, E., "Learning to read," Science, 148: 1066-1072, 1965.

Gleitman, L.R., H. Gleitman and E. Shipley, "The emergence of the child as grammarian," (to appear in Cognition, 1972).

Harris, A.M., How to Increase Reading Ability. New York: McKay, 3rd ed., 1970.

Harris, Z.S., Methods in Structural Linguistics. Chicago: Univ. of Chicago Press, 1951.

Hochberg, J., "Components of literacy: speculations and exploratory research," in Levin, H. and J. Williams, (eds.), Basic Studies on Reading. New York: Basic Books, 1970, pp. 74-89.

Hockett, C.F., A Course in Modern Linguistics. New York: Macmillan, 1958.

Katz, P. and M. Deutsch, "The relationship of auditory and visual functioning to reading achievement in disadvantaged children," in M. Deutsch and Associates, (eds.), The Disadvantaged Child: Selected Papers of Martin Deutsch and Associates. New York: Basic Books, 1967, pp. 233-258.

Kolers, P.A., "Three stages of reading," in Levin, H. and J. Williams, (eds.), Basic Studies on Reading. New York: Basic Books, 1970,pp. 90-118.

Kroeber, A.L., Anthropology. New York: Harcourt, Brace and World, new ed. revised, 1948.

Liberman, A.M., F.S. Cooper, D.P. Shankweiler and M. Studdert-Kennedy, "Perception of the speech code," Psychol. Rev., 74: 431-457, 1967.

Liberman, A.M., "The grammars of speech and language," Cognitive Psychol., 1: 301-323, 1970.

Makita, K., "The rarity of reading disability in Japanese children," Amer. J. Orthopsychiat., 38: 599-614, 1968.

Markova, A.K., "Mastery of the syllabic composition of words at an early age," Soviet Psychol., 9: 235-249, 1971.

Money, J., The Disabled Reader. Baltimore: Johns Hopkins Press, 1966.

Read, C., "Pre-school children's knowledge of English phonology," Harvard Educ. Rev., 41: 1-31, 1971.

Rohwer, W.D., Jr., M.S. Ammon, N. Suzuki and J. Levin, "Population differences and learning proficiency," J. Educ. Psychol., 62: 1-14, 1971.

Rozin, P. and J.W. Kalat, "Learning as situation-specific adaptation," in Seligman and Hager, (eds.), Biological Boundaries of Learning, Appleton-Century-Crofts, in press.

Rozin, P. and J.W. Kalat, "Specific hungers and poison avoidance as adaptive specializations of learning," in Psych. Rev., 78: 459-486, 1971.

Rozin, P., S. Poritsky and R. Sotsky, "American children with reading problems can easily learn to read English represented by Chinese characters," Science, 171: 1264-1267, 1970.

Rozin, P., B. Bressman, B. Snyder, M. Taft, and L. Gleitman, "The Ash/Asparagus Test" (in preparation).

Sakamoto, T. and K. Makita, "Reading in Japan," in Downing, J., (ed.), Comparative Reading, 1972.

Savin, H., "What children know about speech when they start to learn to read," in J. Kavanagh and I.G. Mattingly, (eds.), Language by Ear and by Eye: The Relationships between Speech and Reading. Cambridge: M.I.T. Press (in press).

Savin, H.B. and G.T. Bever, "The nonperceptual reality of the phoneme," J. Verb. Learn. Verb. Behav., 9: 295-302, 1970.

Walker, W., "Notes on native writing systems and the design of native literacy programs," Anthropological Linguistics, 11: 148-166, 1969.

Warren, R.M., "Identification times for phonemic components of graded complexity and for spelling of speech," Perception and Psychophysics 9:345-349, 1971.

Wepman, J.M., "Auditory discrimination, speech and reading," Elem. School J., 60: 325-333, 1960.

Woodcock, R.W., "Rebus as a medium in beginning reading instruction," IMRID Papers and Reports, 4: 1-34, 1968.

Woodcock, R.W., C.R. Clark and C.O. Davies, The Peabody Rebus Reading Program. Circle Pines, Minn.: American Guidance Service, 1968.

Figure Legends

Figure 1: One of three stories used in final test in acquisition of elementary logographic reading skills. The story does not include all of the symbols taught. It reads: "MOTHER WANTS WHITE CAR; BROTHER WANTS RED CAR. FATHER GIVES MOTHER WHITE CAR. HE DOESN'T (NOT) GIVE BROTHER RED CAR. BROTHER SAYS HE WANTS RED CAR. FATHER SAYS, "YOU USE WHITE CAR." BROTHER DOESN'T (NOT) WANT WHITE CAR; HE DOESN'T USE CAR. The eight subjects made a mean of 3 errors (23 errors total) on this 40 item story. Seven timed subjects read it in a mean time of 1' 43". The three comprehension questions were: 1. What did brother want?; 2. What will father let brother do?; 3. Who has the white car? A correct answer on each question is worth one point. Out of a total possible 24 points, the 8 subjects achieved 16.

Figure 2: Simplified spectographic patterns sufficient to produce the syllables (di) and (du). (from Liberman, 1970).

Figure 3: Parallel transmission of phonetic segments or "shingling" after encoding to the level of sound (from Liberman, 1970).

Figure 4: Sample of writing from the original experimental syllabary described in this paper.

Figure 5: Samples of writing from the revised syllabary presently being used by the authors (i) early material, (ii) more advanced material.

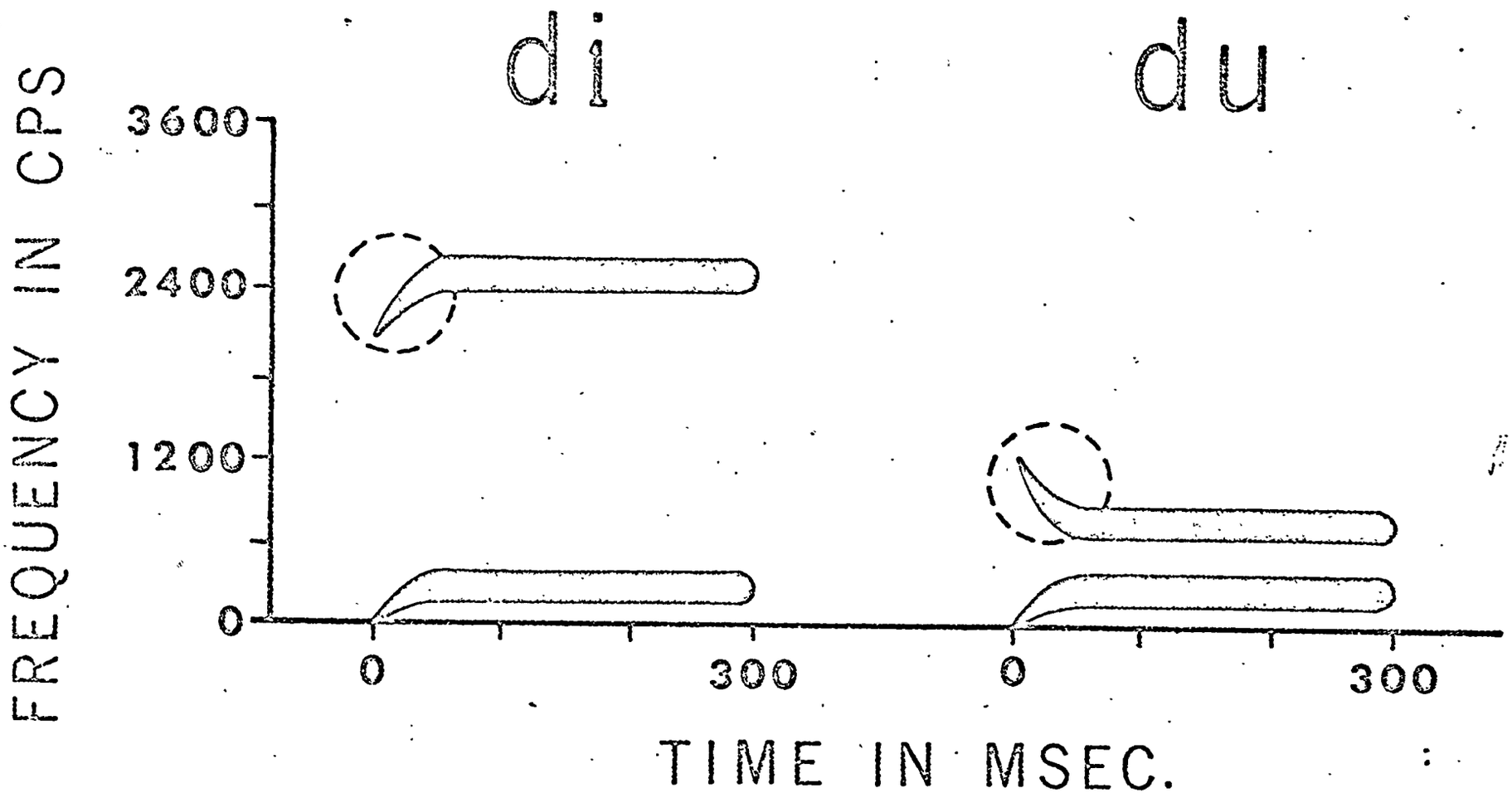
弟要白車；哥哥要紅車，父給弟白車。

他不給哥哥紅車

哥哥說他要紅車

父說，"你用白車"

哥哥不要白車；他不用車。


di
du
FREQUENCY IN CPS
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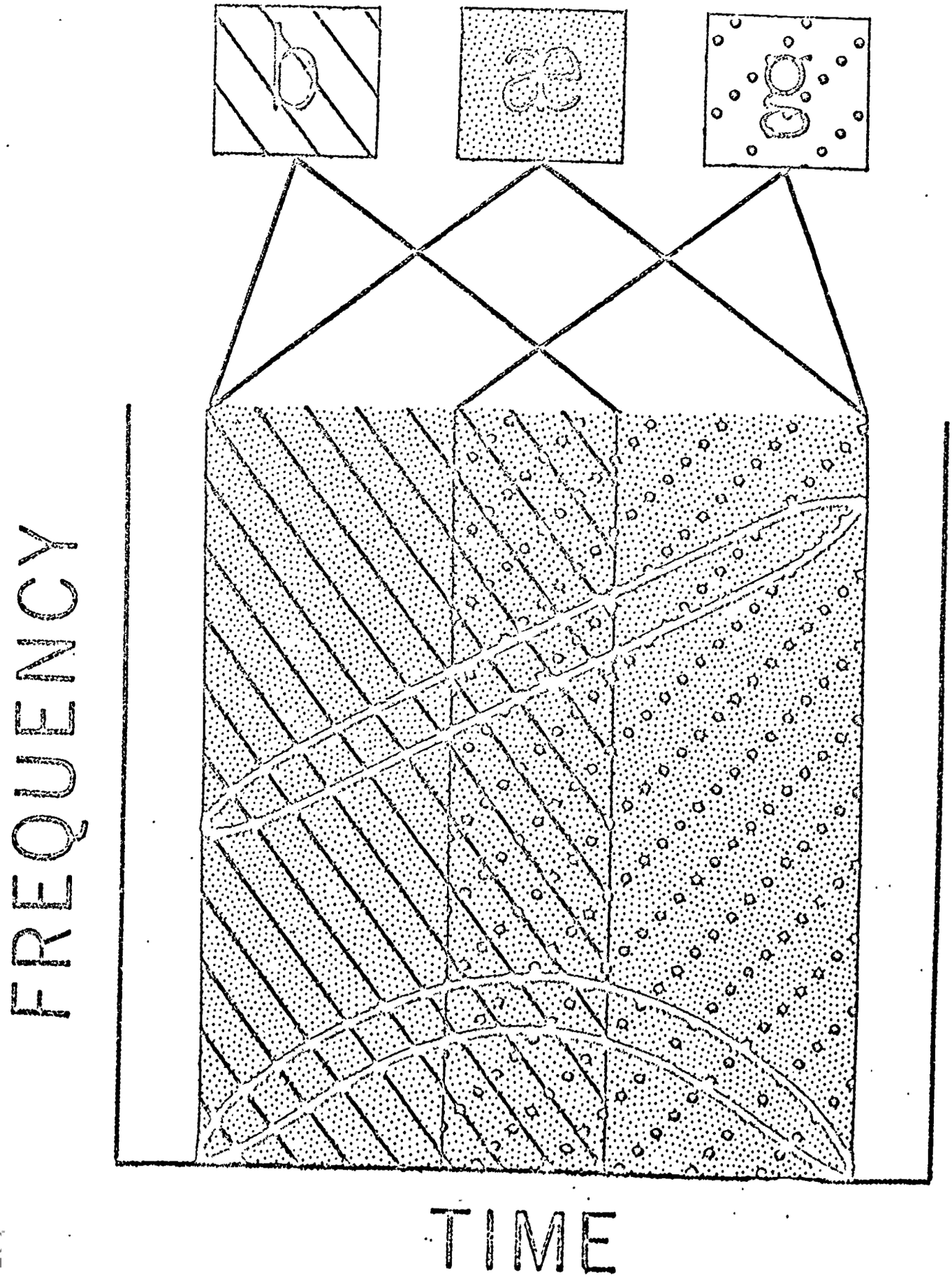
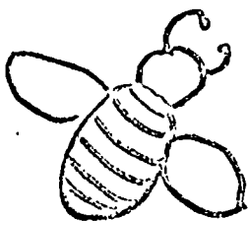
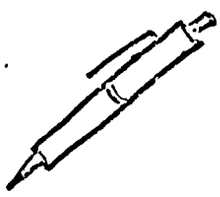
2400
1200
0
0
300
0
300
TIME IN MSEC.


FREQUENCY
TIME

 -D 4 AND-D

 -4 AND-D

 4-GET ,

I O-  THE

 -D .

(i)

WILL | Y WILL YELL

4 FOR  YELL | O  CAN | DY.

(ii)

 SAND | Y THE  HAND | Y MAN IS

GETT | ING THE  CAN | O  PEN | ER

 OUT |  SIDE  ON THE  WIND | OW |  SILL.

TABLE 1

ORIGINAL SYLLABARY CURRICULUM

	NEW ELEMENTS*	NEW COMBINATIONS		NEW ELEMENTS*	NEW COMBINATIONS
1.	I		14.	PUP	PUP-E
2.	CAN		15.	IT	
3.	SEE		16.	IN	PUP-IT
4.	A		17.	TO	IN-TO
5.	BEE		18.	IS	
6.	PEN		19.	SUN	SUN-E
7.	O	O-PEN	20.	DAY	
8.	AND		21.	WIND	SUN-DAY
9.	E	PEN-E			TO-DAY
10.	SILL	SILL-E	22.	ER	WIND-E
11.	D	AND-D			SUN-E-ER
12.	FOR				WIND-O
13.	GET	FOR-GET			WIND-O-SILL
		BE-FOR			

Words omitted from training for use in testing: CAN-D
CAN-O-PEN-ER
PEN-SILL
I-SEE

*Pictographically represented syllables are underlined. All others were symbolized as shown. (Subjects who read the books, but not subjects who took the test of responding to commands, were switched to simplified, all-English orthography before testing.)

TABLE 2

Performance on a comprehension test for an elementary syllabary

COMMAND (new blends are italicized)	Number of subjects who responded appropriately	
	Instructed Group (N=5)	Control Group (N=3)
*GET A CAN	5	3
GET A PENNY	5	0
GET A CANDY	5	1
GET A CANOPENER	5	0
GET A PENCIL AND A CANDY	2	0
GET A PEN BEFORE A CANDY	5	0
GET A PENCIL INTO A CAN	4	1
GET A WINDOWSILL BEFORE A PUPPY	4	0
GET A PUPPET	5	0
GET A ICY WINDOW	3	1
GET A CANOPENER BEFORE A PUPPET	4	0
GET A CANDY INTO A CAN	4	1
All commands	Mean = 10.2	Mean = 2.3

*This is the only command that contains no blends.