PHONEME SEGMENTATION IN THE ACQUISITION OF READING

by

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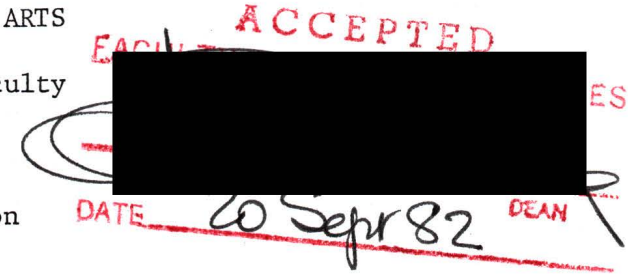

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Abstract

The background of the theory of phonemes is reviewed, examining the phoneme as an important concept for its relationship to learning to read and write. Reading theory and reading instruction method controversies are discussed. Current research findings related to the phoneme theory and those directly related to the use of phoneme segmentation in beginning reading instruction are reviewed. Some reading approaches based on the phoneme concept are described. Special attention is given to relevant studies in the Soviet Union, where phoneme theory has been more influential. In particular, Elkonin's theory of phonematic hearing and its relation to the beginning reading process is stated and his teaching methodology of phoneme segmentation training is described in detail. Research related to his theory is reviewed. In this thesis, phoneme segmentation is considered as a sub skill of the skill of reading. The Phoneme Segmentation Test was constructed to be a measure of children's oral phoneme segmenting ability. The test's development and the results of the tryouts of the test are reported. Validity data for the final version is included. For the experiment on teaching phoneme segmentation in kindergarten, all members of one class were taught by the experimenter. Each child was given six lessons in segmenting over a period of two weeks. These lessons were taught individually or in groups in the corner of the kindergarten room while the class was in session. The earlier developed Phoneme Segmentation

Test was the testing instrument for this experiment. The teaching procedures that were developed are considered for possible use by teachers in regular classroom situations. The problems met in this field experiment and the possible future design are discussed. The relation of phoneme segmentation ability to beginning reading and the use of the Phoneme Segmentation Test in assessing this skill is considered. The results of this experiment indicate that phoneme segmentation training is effective in improving this skill in kindergarten children and that the effect is relatively long term.

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CHAPTER I

INTRODUCTION

Background of the Theory of Phonemes

There is a vast quantity of literature available on reading and on beginning reading instruction. Much of this material discusses phonetics in relation to beginning reading instruction, but relatively little consideration has been given to the phonemic aspect of language or the possibility of the importance of the phoneme and phoneme segmentation ability to the beginning stages of acquiring the skills of reading and writing.

It is essential that any discussion of a phonemic theory of reading should encompass three matters: (1) the reality of the phoneme; (2) its definition; and (3) ideas about letters and sounds in teaching phonics at the beginning reading level.

Through studies of aphasia it has been found that lesions in the superior temporal gyrus in the region adjacent to the primary auditory cortex will produce "a disorder of phonemic hearing in which there is an acquired difficulty in discriminating between similar phonemes, causing difficulty in understanding spoken speech" (Walsh, 1978, p.159). In his text, Neuropsychology, Walsh cites Luria, the eminent Soviet neuropsychologist's description of an aphasic patient: "As words in his own language fail to be differentiated, his attitude towards words in his native tongue will begin to resemble that of words in a foreign language" (Luria, 1973, cited by Walsh, 1978, p.159). The definition of

the phoneme used in the Walsh text is:

> A phoneme is the smallest distinctive group of sounds in a language and one of the principal tasks in learning a language is to distinguish readily between phonemes (Walsh, 1978, p.159).

Phonemic hearing must have been acquired in order for it to have been lost by an adult through physical trauma.

In linguistics, a rather different approach may be made to this problem. Lehmann states that "definitions of phonemes have varied greatly depending on the point of view from which they are proposed" (Lehmann, 1972, p.62). Linguistic texts and dictionaries give different and often ambiguous definitions.

Finding a definition for the phoneme can be rather elusive. The major dictionaries such as the Oxford English Dictionary and the Webster's Third New International Dictionary have the International Phonetic Association pronunciation guides as well as pages of notes on phonetics. However, neither of these dictionaries, in their prefaces, provides a key for phonemes or makes any direct mention of them. The New Canadian Funk and Wagnall Standard College Dictionary (1973) has used phonemes as the basis for the Pronunciation Key on its inside front cover but it does not state that this is a "phonemic" division. The definitions given in all these dictionaries are different and complex. It was not until 1973 that "phoneme" became a subject heading in Psychological Abstracts.

There is a noticeable difference between American and European linguistics in their attitudes toward the concept of the phoneme.

In the U.S.A., linguistics is considered one of the "youngest behavioral sciences" (Lehmann, 1972, p.vii) and has shifted from phonological, through syntactic, to semantic studies. Until recently, the phoneme concept has been avoided. Chomsky's statement that the "goal of the descriptive study of language is the construction of a grammar" (Chomsky & Halle, 1968, p.11) has helped to focus interest in that area. Further, when discussing "phonemic representations" in modern structural linguistics, Chomsky stated: "the existence of such a level has not been demonstrated and that there are strong reasons to doubt its existence" (Chomsky & Hall, 1968, p.11). This did nothing to evoke interest in phonemes at that time.

By contrast, a very different path has been taken by the European linguists, particularly by those of the Prague School, one of whom, Kramsky, in reviewing the history of the phoneme proclaims:

> The discovery of the phoneme is one of the most magnificent achievements of linguistic science. We dare say it equals the discovery of atomic energy as it brings with it a similar revolution in linguistic thinking as the discovery of atomic energy does in technical sciences. Nowadays we do not quite realize what a revolutionary reversal in linguistics it was when the phoneme was established as a linguistic unit. It was the first time that man was able to take hold of speech, to base himself on something that, though only an abstraction, yet from the point of view of the language system was, after all, something very concrete. ...The phoneme is one of the universals of language. There is no language which does not know phonemes. In all languages phoneme is a basic unit (Kramsky, 1974, p.7).

The following are some notable definitions of the phoneme by linguists in Kramsky's detailed and comprehensive review of the various theories of the phoneme from both Europe and North America. Only a few examples are taken from Kramsky's (1974) text:

> Trnka defines the phoneme as every sound that is capable of semantic differentiation (p.35).

> Vachek devotes much space to the distinction sound - phoneme. ...Finally, Vachek gives the following functionalist definition of the phoneme: The phoneme is a signal-like counter of the language which becomes manifested in actual speech by means of (two or more) sounds which are (1) related in character and (2) mutually exclusive as to their phonic surroundings. All exceptions to (2) must be accounted for on morphematic grounds only (Vachek's 1932 paper on "Prof. Daniel Jones and the Phoneme," p.51).

> By his theory of distinctive features, Jakobson has given the definition of the phoneme a solid unifying basis which is now generally accepted. There may be differences in opinion on secondary problems connected with the conception of the phoneme, but the basic characterization remains unchanged; the phoneme is universally regarded as a bundle of distinctive features (p.126).

Kramsky also discusses the work of Daniel Jones, a member of the "London School," but the following notes are taken directly from Jones' (1967) book, The Phoneme: Its Nature and Use. Jones has an appendix, "The History and Meaning of the Term Phoneme," in which he comments that the concept of the phoneme is ancient but the formulation of the theory is very new. "It is natural that in their early attempts at representing their languages by means of an alphabet men should write them phonemically" (Jones, 1967, p.253). The first linguist who is known to have formulated the theory of phonemes was a Russian,

Jan Baudovin de Courtenay (1845-1929). His realization of the principle was shown by the distinction he drew between "broad" and "narrow" types of phonetic transcription, the "broad" corresponding to the phonemes of the language. Jones notes that Henry Sweet in England was "discovering" the same idea independently at the same time--entirely unaware of Courtenay's work.

The "Prague School" extended this work to the whole field of linguistic theory and devoted much attention to the phoneme. By 1916 two ways of viewing this concept had come about, the "psychological" and the "physical:"

> Viewed "psychologically" a phoneme is a speech-sound pictured in one's mind and "aimed at" in the process of talking....Viewed from the "physical" angle a phoneme is a family of uttered sounds (segmental elements of speech) in a particular language which count for practical purposes as if they were one and the same....They are not incompatible; in fact they lead to the same practical results. Together they formed the foundation upon which a complete theory had to be built (Jones, 1967, p.258).

Little had been done towards applying the phoneme theory to any language but Russian at that time. The Department of Phonetics at University College, London, started further development of the theory. "No one else in Western Europe or America seemed to be interested at that time" (Jones, 1967, p.259). They considered both the psychological concept and the physical concept of the phoneme to be tenable but came to the "conclusion that the physical view of the phoneme is on the whole better suited to the needs of ordinary teaching of spoken languages" (Jones, 1967, p.260). When considering the need for the phoneme concept, Jones commented that it is constantly found in language

study that several distinct sounds in a language have to be considered as if they were one for orthographic, grammatical and semantic purposes. As such, there are in reality small families of sounds that are the "sounds" or "essential sounds" of a language, and those included in each family are termed its "members" or "allophones." Jones' general definition is:

> a phoneme is a FAMILY OF SOUNDS IN A GIVEN LANGUAGE WHICH ARE RELATED IN CHARACTER AND AND USED IN SUCH A WAY THAT NO ONE MEMBER EVER OCCURS IN A WORD IN THE SAME PHONETIC CONTEXT AS ANY OTHER MEMBER (Jones, 1967, p.10).

Jones also states:

> It is therefore a corollary...that phonemes have a semantic function in languages. For since a member of a phoneme <u>can</u> occupy the same situation as the appropriate member of another phoneme, it is possible to alter a sequence by exchanging a sound for the appropriate sound of another phoneme. Such an alteration may change a word into another word. In other terms, the differences between phonemes are "significant," i.e. capable of distinguishing one word from another (Jones, 1967, p.14).

For the practical use of the theory of phonemes, Jones gives three main uses. First, it is the basis of phonetic transcription, the means to learning good pronunciation of one's own language or learning a foreign language. Second, it forms the basis for the non-phonetic branches of linguistic science such as semantics, morphology, and grammar. "In fact, all practical linguistic attainments may be said to depend ultimately on the theory of phonemes" (Jones, 1967, p.219). Third, Jones writes that "the phoneme theory

has a particular important use in connection with the construction of systems of writing. The analysis of a language into its constituent phonemes furnishes us with the means of writing it in the simplest manner that is consistent with avoiding ambiguity" (Jones, 1967, p.219). Jones notes that "two kinds of simple writing can be established with the aid of the phoneme theory, namely, phonetic transcription and orthography"(Jones, 1967, p.220).

Jones' distinction between these two kinds of writing is extremely important for "phonic" instruction in reading. The orthography referred to by Jones is the conventional system of written symbols or graphemes that are written by a writer or read by a reader. Graphemes in an orthography thus do not represent a precise phonetic transcription, but each grapheme or graphemic group, e.g. ng, igh, dge, eigh, symbolizes one family of sounds termed "a phoneme." This is what teachers need to understand in the teaching of reading. For example, the letter d in English orthography is not a phonetic transcription of the initial sound in "dog" and "daisy," or the middle sound in "udder" and "fiddle." Each of these sounds is phonetically different, although phonemically they are "the same," i.e. they belong to the same abstract category of sounds. Thus it is incorrect to teach children that the letter d stands only for the sound at the beginning of "dog." In addition, of course, the letter d has other non-phonemic uses in English orthography. For example, ed is used to denote past tense, no matter how pronounced, e.g. hated, smacked, played. The extent to which children need to be

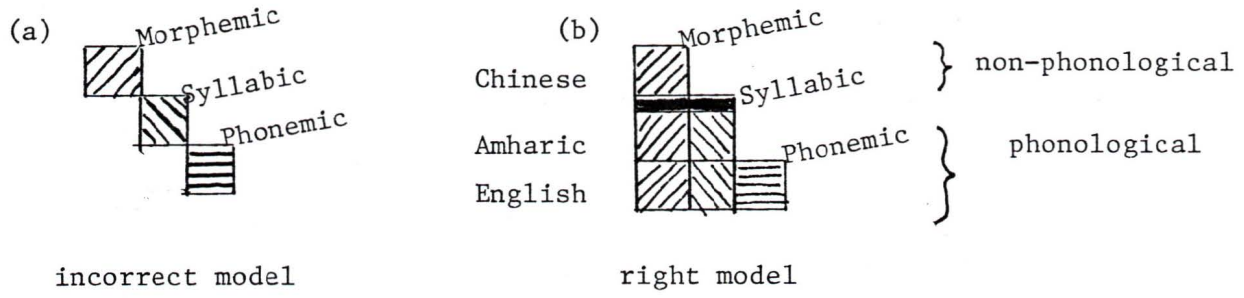
made aware of these linguistic structures in orthography is a topic of vigorous debate at this present time.

The International Reading Association Reading Research Seminar held at the University of Victoria in 1979 brought together leading theorists, researchers and teachers to discuss "Linguistic Awareness and Learning to Read." One of the participants, John Mountford, discussed some of the difficulties that have developed in the communication of ideas between linguists and those without linguistic training. Mountford suggested "four simple notations...for the four units into which words are commonly analysed: morpheme, syllable, phoneme, and letter..., as serviceable linguistic concepts and notations are badly needed by teachers" (Mountford, 1979, p.1). Here we are concerned only with Mountford's definition of "phoneme" which agrees with the ones given by the Prague School and the London School. In many ways Mountford's is simpler to understand in layman's terms:

> Words in pronunciation, consist of sequences of consonants and vowels. The collective name for these consonant sounds and vowel sounds is, quite simply, "phonemes" (Mountford, 1979, p.3).

English is three writing systems all in one, based on morphemic, syllabic and phonemic (alphabetic) considerations respectively. It is important to note that the three systems are <u>not</u> mutually exclusive but are overlaid on each other in varying degrees. In order to clarify some of the complexity of the writing systems of English, Mountford diagrams it thus:

Threefold Classification of Writing Systems



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(Mountford, 1979, p.4).

This is in agreement with Downing's comments that the "English writing system seems to be so mixed in its techniques for coding spoken language that there has been and still is considerable controversy over the nature of the written code" (Downing, 1979, p.58). He discusses the alternatives in three catagories: (1) classical phonemic theory--its graphemes are symbols for phonemes (2) anti-phoneme descriptions--that "phonemes are artificial units having no linguistic status" (Chomsky, 1970 cited by Downing, 1979, p.60) and (3) multi-code descriptions--other kinds of codes at work in addition to the phonemic. "The historical and phenomenological evidence seems to give greater support to this multi-code view than to the classical phonemic and the anti-phonemic descriptions....English orthography was originally a code for phonemes, and this phonemic principle has been consciously maintained and persists to the present day" (Downing, 1979, p.69).

Mountford also makes a strong point about adults' lack of empathy

with the young child's situation in acquiring language and reading. He describes the adults' confusions regarding these linguistic tasks:

> Children acquire language in the medium of speech, and whatever lexical/grammatical connections they make between morphemes are made solely in terms of phonology--a state of affairs which it is immensely difficult for literate adults to recapture, even though we all passed through it as children. The intervention of literacy upon our linguistic awareness is massive, and so far little studied.
>
> It is so great, that the confusion I mentioned earlier between morphemes and syllables is overshadowed by a profounder confusion between phonemes and letters; the shapes of the orthography come between the literate and his awareness of phonology, of which he has nonetheless complete control. This phenomenon is so widespread that we take it to be the norm and accept it in learners and teachers alike (Mountford, 1979, p.5).

This confusion, undoubtedly, has been one of the reasons that the acceptance of the concept of phoneme has been so slow. In the actual learning of speech, the phoneme is so basic that there has seemed no need to consider it specifically. Parents have modelled clear speech and corrected their infants during their learning of language, but have assumed that the skills of reading and writing need to begin with the visual form. Other parents have not considered the problem at all.

It seems evident that the phoneme is an important concept for discussing and thinking about language. It permits a logical description of the way in which phonological units are related to other aspects of language--semantics and syntax in the mode of speech which we all learn first of all as children. Non-literate societies do not

need to prepare for the matching of such oral speech patterns to written language but, in literate societies, the important step for which schools are organized is this task of learning to match the oral code to the written code, to learn to encode and decode the language in written form. How this should best be organized is of increasing interest, as the expectations arise that every child shall become effectively literate. Methods are needed that will help children to understand the basic relationship between the phonemes of speech and their representation by the graphemes of alphabetic writing. Since oral language is the language system that is already well developed when children enter kindergarten, it may be appropriate to take the first step in preparation for learning to read and write by increasing their awareness of phonemes at this age level. Learning proceeds from the known to the unknown. Children enter kindergarten with a basis of practical knowledge of the use of speech. But they are not usually aware of its phonemic basis. Increasing this awareness could be the first step from the known into the larger unknown of the complex task of acquiring the skills of literacy.

Aim of the Present Research

The theoretical proposition stated at the end of the previous paragraph is the focus of the research reported in this thesis. The chief aim of this study was to test the effects of training children's awareness of phoneme units in speech. A second aim of the study was

to develop a new instrument for measuring children's awareness of phoneme units in speech. No measure of this type has been published previously. Hence, the development of what will be referred to later as "The Phoneme Segmentation Test" was a major part of the work of this thesis, and therefore, its construction will be described in precise detail in Chapter III. However, before an experiment including the test development could be designed and conducted, it was necessary to review the theoretical and research literature that is related to the theoretical proposition stated above. This is the topic of the next chapter.

CHAPTER II

REVIEW OF RELATED LITERATURE

Reading Theory Controversies

The controversies that surround the theories and methods of teaching reading are many. Much time and effort has been expended in developing programs, sometimes attending to theory, sometimes not. Furthermore, although research continues into how children learn to read, rather little of this filters down to the classroom teacher. In the English speaking countries particularly, teachers of reading usually have not considered the phoneme directly but have argued the relative merits of the "look-say" and the "phonics" methods. Both methods have been heavily criticised (usually by the proponents of the competing method). This thesis is not concerned with the claims for these two rival methods camps. The focus rather, must be on the way in which phonics methods may or may not be related to the theory of phonemes.

Fries gives the following generalized account of phonics methods:

> For many teachers the word phonics seems to stand for almost any procedure that seeks to make connections between the pronunciation of a word and its spelling...and so phonics has been and continues to be a way of teaching beginning reading...matching individual letters with specific sounds (Fries, 1962, p.156).

Fries asserted that "Alphabetic writing is basically phonemic" (Fries, 1962, p.155). He developed a spelling pattern method for relating phonemes to graphemes as a basis for phonic instruction.

However, Fries' method, like the other so-called "linguistic approaches" of the 1960s, gained little acceptance among teachers of reading.

Shankweiler and Liberman, researchers at the Haskin's Laboratories, New Haven, Connecticut, in discussing their research into the relationship between reading and speech, comment on this controversy over methods:

> Given so little agreement on how best to teach children to read, it is perhaps not surprising to find divergent conceptions of the nature of reading itself. Among these, we find two contrasting positions concerning the relationships between reading and speech. On the one hand, some writers (e.g., Goodman, 1968,; Smith, 1973) have tended to ignore the relationship, choosing instead to emphasize the relative autonomy of reading and writing. Their counsel is, in effect, to forget about speech when teaching reading. A major target of their criticism has been the advocate of the so-called phonic approach to reading instruction who stresses the letter-to-sound mappings while failing to appreciate that we cannot read simply by concatenating individual letter sounds. On the other hand, we and a few other investigators (Huey, 1908; Mattingly, 1972; Rozin and Gleitman, 1976; Shankweiler and Liberman, 1972) have emphasized the importance of the derivative nature of reading and writing and the intimate connection between speech and the alphabet (Shankweiler and Liberman, 1976, p.297).

Goodman and Smith expect that the "child learns to read <u>by reading</u> and gradually picking up the parallelism of listening and reading, rather like running alongside a moving train and jumping on to it when one has reached a matching speed" (Downing, 1979, p.33). For some reason not every child manages to catch the train. Smith also assumes that, before beginning to read, the child has a "rich

and fully functioning knowledge of the spoken aspects of his language" (Smith, 1971, p.223). This view would be regarded with scepticism by kindergarten teachers who regard oral language teaching as one of their major tasks. Indeed, language ability is one of the areas of assessment for predicting progress in grade one. Smith has provided insight into the complexity of reading and particularly fluent reading but he gives no evidence for his statement that it is "quite an unfounded assumption that reading instruction must involve teaching children about language" (Smith, 1971, p.223). Smith's dismissal of the importance of teaching methods has led to the unfortunate misunderstanding that either all methods are equally useful or that none has any effect. This may not be what he meant but this is often the way it is understood.

But can beginning reading instruction be planned on the model of the behavior of fluent readers, as Goodman and Smith appear to attempt? Downing and Leong, in their discussion of reading as a skill, question whether fluent reading of a mature reader can be a model for the process of learning to read:

> However, it is questionable if the learning-to-read process is directly derivable from the fluent reading process, as Goodman and Smith both imply. It is a characteristic of skills that they change in the course of their development. Behavior appropriate to the beginning stage drops out later as mastery progresses. New behaviors are incorporated as attention is freed from acts that have become more automatic. Elkonin (1973b) writes: "It is only the summarized, abbreviated and highly automated nature of the perfected form of this skill that gives the impression of a simple association between speech and print.

> Prior to this level of performance, the skill must go through a long period of development and its initial form is not in the least like its final one. One of the most flagrant errors in methods of reading instruction, in our view, is the belief that the initial and final forms of any skill are identical. Their processes are always very different (Downing and Leong, 1982, p.39).

Forester, too, appears to advocate beginning reading with the whole developed skill rather than with instruction in some of its component subskills. Commenting on observations made on classroom reading and phonics program procedures she states: "The inability of children to focus on sounds, letters of words in isolation suggests that lessons in phonics, morphology and sight word drills should be eliminated or at least postponed" (Forester, 1975, p.85). But Forester's speculative explanation is only one of many possible alternatives. For example, these types of lessons may be ineffectual because of failure to prepare the students for this type of instruction by giving them the background of linguistic awareness and knowledge needed to comprehend such lessons. Certainly one must question Forester's assertion that information about the linguistic basis of English orthography should be withheld from beginners. Smith's own summation can be regarded from another viewpoint. He states that "the teacher's contribution can be summed up in one word--<u>information</u>. A child has to be shown the type of material from which he must reduce uncertainty, he must be told where the uncertainty lies. He must be told what the task is" (Smith, 1971, p.228). In the opinion of

the present writer, for some children the "uncertainty" perhaps may be with regard to the sounds, phonemes, and the structure of their language. This may be the information they need at the very beginning of learning to read.

Shankweiler's and Liberman's conclusions would support this view:

> Reading, however, presents special problems for the perceiver, the nature of which reflects the manner in which the writing system makes contact with the primary speech system. In the case of English, the ties between the language and its spelling are based only partly on the sound structure. Nevertheless, it is particularly appropriate to direct the child's attention to the phoneme level, because the phonemic correspondences are the entry points to any alphabetic writing system (Shankweiler and Liberman, 1976, p.312).

Mattingly describes how this phonemic entry point may be achieved. Firstly, one should note that Mattingly distinguishes linguistic awareness from linguistic activity itself. Much of the latter is not accessible to immediate awareness. Mattingly's view is that:

> this relationship is much more devious than it is generally assumed to be. Speaking and listening are primary linguistic activities; reading is a secondary and rather special sort of activity that relies critically upon the reader's awareness of these primary activities (Mattingly, 1972, p.133).

By this reasoning, linguistic awareness is crucial.

> Reading is seen not as a parallel activity in the visual mode to speech perception in the auditory mode; there are differences between the two activities that cannot be explained in terms of the difference of modality. They can be explained only if we regard reading as a deliberately acquired, language-based skill, dependent upon the speaker-hearer's awareness of certain aspects of primary linguistic activity. By virtue of this linguistic awareness, written

> text initiates the synthetic linguistic process common to both reading and speech, enabling the reader to get the writer's message and so to recognize what has been written (Mattingly, 1972, p.145).

Mattingly's concept of linguistic awareness seems to be similar to one of the two aspects of "cognitive clarity" described in Downing's theory of the acquisition of reading skill. Downing writes that "There are <u>two</u> aspects of children's developing understanding of the reading task: (a) understanding its purposes (b) understanding its technical characteristics" (Downing, 1979, p.36). The second of these two aspects would include Mattingly's "linguistic awareness" concept. Downing's more comprehensive theory takes account of both aspects of learning to read. He writes: "It may be called the <u>cognitive clarity theory of learning to read</u>. It can be regarded as part of a more general theory of skill learning in the three phases proposed by Fitts and Posner. But this learning to read theory had its main emphasis on the cognitive phase in which the learner gropes for understanding of the tasks to be accomplished in the acquisition of reading skill" (Downing, 1979, p.36-37). Downing has summarized this theory in eight postulates of which the first four are relevant to this present thesis. They are:

> (1) Writing or print in any language is a visible code for those aspects of speech that were accessible to the linguistic awareness of the creators of that code or writing system; (2) this linguistic awareness of the creators of a writing system included simultaneous awareness of the communicative function of language and certain features of spoken language that are accessible to the speaker-hearer

> for logical analysis; (3) the learning-to-read process consists in the rediscovery of (a) the functions and (b) the coding rules of the writing system; (4) their rediscovery depends on the learner's linguistic awareness of the same features of communication and language as were accessible to the creators of the writing system (Downing, 1979, p.37).

The writer of this thesis proposes that the phoneme is one of these features that has to reach linguistic awareness in the learning-to-read process and that the cognitive clarity theory points to a very practical approach to the beginning reading process.

Research Related to the Phoneme Theory

As has been noted earlier, study of the phoneme concept in relation to beginning reading remains a relatively unexplored area. The more significant recent research findings on this matter will be presented in this section.

From recent research in England on phonology and its relation to beginning reading, Doctor and Coltheart concluded that "very young readers rely extensively on phonological recoding when reading for meaning; as they grow older, reliance on visual recoding becomes progressively more important (Doctor and Coltheart, 1980, p.195). Hence, it would seem to follow that the reading skill behavior of young beginners is not the same as the skill of mature fluent readers, and that phonological recoding is an important characteristic of beginning reading.

In Norway, Skjelfjord (1976) tested children who had been taught to segment spoken words as an aid to learning to read. During the course of his work he noticed that:

> Nothing in the results points to individual differences as to type of processes involved in the analysis. All pupils seem to employ the same type of analysis. Also, the children are not learning to recognize specific phonemes, but are learning an analytic skill. Untaught phonemes are segmented as efficiently as taught phonemes (Skjelfjord, 1976, p.305).

He also noted that "inspection seems to reveal a clear correlation between analytic skill and reading proficiency" (Skjelfjord, 1976, p.305).

In Canada, studies directly related to phoneme awareness have been conducted by Downing and his colleagues. Johnson, Ollila, and Downing (1973) in their study, "The Effect of Auditory Discrimination Training on Reading Readiness Measures," reported the use of a phoneme segmentation training procedure adapted from the one created by Elkonin (1973) in Russia for one of their three treatment groups. The program was evaluated by four sub-tests from the experimental Canadian Reading Readiness Test (Evanechko, Ollila, Downing, and Braun, 1973), and the Wepman Test of Auditory Discrimination (Wepman, 1958). The results obtained in this study seemed promising because the "only two significant differences found between treatments both favored the Russian program over the two American ones (Ollila, Johnson, and Downing, 1974, p.1141). Also in Canada, Leong and Haines (1978) have studied the awareness of phonemes, syllables and sentences in primary grade children. "The findings were discussed in relation to the

temporal order of sounds in words and word order in sentences. Children's reflection on sounds in words, on the grammatical structures of sentences, is seen to facilitate their learning to read" (Leong and Haines, 1978, p.383).

In the U.S.A., since the early 1970s, researchers at the Haskins Laboratories, Connecticut, the Libermans and their colleagues have worked on phonology and short term memory and their relationship to reading. In a 1976 report of children's segmentation of speech into syllables and phonemes, they stated:

> If the indications of our pilot work are borne out, failure on both the syllable and the phoneme tasks at the first grade level will be prognostic of extreme reading difficulty....In order to learn to read an alphabetically written language, the availability of a phonetically organized short-term memory is not sufficient. In addition the child must have the ability to make explicit the segmentation of his own speech, particularly at the level of the phoneme....We noted that phonemic awareness is lacking in many children when they start to learn to read, and may be a cause of reading failure (Shankweiler and Liberman, 1976, p.312).

Many aspects of phonology, linguistic awareness and their links to orthography have been studied by the Haskins Laboratories group. More recently, they have reported that:

> Three subsequent studies by our research group (Helfgott, 1976; Treiman, 1976; Zifcak, 1977) have now substantiated these results. The consistency of positive findings in all these correlational studies, despite widely diverse subject populations, school systems, and measurement devices, gives us confidence that there is, at least, a correlation between awareness of segmentation and success in learning to read (Liberman, Liberman, Mattingly and Shankweiler, 1980, p.144).

Their concluding statement was:

> There is, then, considerable support for the assertion that, for purposes of storing linguistic information in working memory, poor readers do not rely as much on a phonological strategy as good readers do. Given the effectiveness of the phonological strategy, and given that reading may put working memory under stress especially in the beginner, we see that failure to use the phonology properly may be a cause, as well as a correlate, of poor reading (Liberman, Liberman, Mattingly, and Shankweiler, 1980, p.153).

In the study cited by Liberman et al, (1980), Helfgott (1976), explored the abilities of kindergarten children in segmenting and blending phonemic components. "Each experimental group received training in one of three types of word division (either C-V-C, CV-C or C-VC) for phonemic segmentation and blending in one of two task sequences (either blending first or segmentation first). Results indicate that segmentation is significantly more difficult than blending and that C-V-C is the most difficult of the three types of word division for both segmentation and blending" (Helfgott, 1976, p.157). The Wide Range Achievement Test (WRAT) (Jastek, 1965) and the Wepman Auditory Discrimination Test (Wepman, 1958) were used for assessment. The Wepman test did not show any significant effect but the WRAT indicated, one year later, that "C-V-C segmentation is a highly useful predictor of beginning reading acquisition" (Helfgott, 1976, p.157). Although the Wepman test uses the phoneme as the factor for discrimination between words, it might be noted that it is not a direct test of phoneme segmentation but it is the closest standardized test that is available at present.

Two more interesting studies are those of Wallach, Wallach, Dozier and Kaplan (1977) and Marsh and Mineo (1977). Both studies dealt with children's recognition of phonemes. The acknowledgement of the phoneme as an important factor for research in the preschool and kindergarten age group is one of the features of both studies.

Zifcak's (1977) doctoral dissertation cited by Liberman et al. (1980), "Phonological Awareness and Reading Acquisition in First Grade Children" reported that:

> The best single predictor of the first grade child's reading performance is phoneme segmentation ability, and, together, phoneme segmentation and invented spelling abilities provide the optimum prediction of success in learning to read.
>
> The study thus suggests that phonological awareness as measured by phoneme segmentation and invented spelling abilities may be an essential prerequisite to successful reading performance for the first grader. The results also demonstrate that exceptional intelligence or an exceptional environment is not necessarily responsible for this strong relationship between phonological awareness and reading ability, nor is this relationship directly dependent on chronological age or sex.

Williams (1977) assessed the research data to see if it might be of "some value to design remedial curricular materials focussed on improving the language skills of poor readers" (Williams, 1977, p.277). Her concern at that time was the possibility that ideas could be accepted too quickly and at a superficial, or shallow, cognitive level. Thus she wrote:

> It would be wasteful and indeed unfortunate if people jumped on a bandwagon, declaring that training on linguistic skills was the answer, without taking the time to evaluate the notion--or to examine the relationship of whatever language abilities were to be trained to actual reading performance. We would probably be in for a repeat of 25 years of, first, excitement, followed by disillusion, and finally, an admission of "no progress" (Williams, 1977, p.277).

Williams did proceed to develop an instructional program called the ABD's of Reading which provided "explicit training in phoneme analysis and phoneme blending, letter-sound correspondences, and decoding" (Williams, 1980, p.1). In view of her caution, her results and evaluation of the program are not lightly given:

> The results of 2 years of program evaluation in New York City classrooms for learning-disabled children indicated that the program successfully teaches general decoding strategies. That is, instructed children were able to decode novel combinations of letters that were not presented in training. No extensive teacher training, teacher-aides, or other unusual classroom support was required (Williams, 1980, p.1).

The phoneme research studies had also interested Lewkowicz. In 1979 she and Low began a study of the Soviet methods. In their research project, they used a three stage training program of three sets of CV, VC, and CVC words, four training words and eight testing words. The "visual aids used were counters, squares drawn on a piece of paper, and pictures, as in the Elkonin experiments" (Lewkowicz and Low, 1979, p.242). In the first stage, the experimenter and then the subject said the words " 'stretched' out in slow motion" (p.242). In the second stage, they "segmented the word with clear pauses

between sounds, simultaneously, for each sound, sliding a counter into a square or into the rectangle or touching a square with the stick" (p.242). Earlier in their description of their procedures, they had stated that this rectangle was undivided. The third stage was primarily to help insure pausing between segments" (p.243). In describing their results, they indicated that the "squares made a significant contribution to the segmentation of two-phoneme words" (Lewkowicz and Low, 1979, p.238). But they reported that none of the visual aids made any difference on the three-phoneme words. This apparent conflict with the Russian results was given two possible explanations. One, that, in learning the two-phoneme words, the benefit from the nature of the training task had already been derived and no further benefit was added in extending the training task to three-phoneme words. Another explanation proposed was that the "equipment makes a difference mainly in the first segmentation efforts regardless of word structure" (p.249).

In this author's opinion, one of the difficulties in assessing the results of this study by Lewkowicz and Low is that they did not follow Elkonin's original intention that the aids were to be used in sequential stages of learning rather than as alternate means. Elkonin developed his methods according to Galperin's (1959) theory of skill development. There should be a sequential organization for the removal of the visual aids. All three aids, squares, blocks and pictures, are to be used for the first level of difficulty. For the next level of difficulty, one of the aids, the squares, is removed

and for the next level, the pictures. There is a gradual change from the use of all aids to the use of no aids, moving in the sequential order of Galperin's five stages towards a totally mental ability to segment phonemes. Thus Elkonin would agree with Lewkowicz and Low that the squares are a most important factor in the beginning stages. But he would not accept their transformation of his sequence into alternatives. Thus, although Lewkowicz and Low did not replicate Elkonin's work, their comment that "squares made significant contribution to the segmentation of two phoneme words" (Lewkowicz and Low, 1979, p.238) does support Elkonin's contention that "practical operations with concrete objects must be provided...that will lead the child to discover the basic physical relationships that characterize the sound form of the word--the relationship of the succession of sounds" (Elkonin, 1973, p.560). It has also given support for considering the concept of phonemes and the materializing of phonemes as aids to linguistic awareness. A further and more detailed description of Galperin's skills theory and its relation to Elkonin's work will be found in this thesis on page 49 and this author's understanding of Elkonin's methods are described on pages 59-62 of this thesis.

In another study, Lewkowicz categorized the various phonemic awareness training tasks "according to their probable usefulness in the early stages of reading-readiness training (Lewkowicz, 1980, p.686). The article, "Phonemic Awareness Training: What to Teach

and How to Teach It," also surveys current knowledge on how to teach segmentation and blending. These categories and specific items will be referred to again after the description of the Phoneme Segmentation Test in the next chapter of this thesis. Lewkowicz's survey is considered to serve as a preliminary validation of the choice of items for that test.

Reading Approaches Based on the Phoneme Concept

Two reading approaches in current use that employ the phoneme concept are the "initial teaching alphabet" (i.t.a.) and the Open Court Reading and Language Arts program. Authors of articles and books on i.t.a. describe it as phonemic but Open Court Publications term their program "phonic." A brief account of these two programs follows.

A direct application of phoneme theory in the teaching of beginning reading is found in the i.t.a. reading experiment conducted in Britain in the 1960s. Traditional orthography (t.o.) of English has been the subject of criticism for making the learning of reading and writing difficult and slow. The i.t.a. was designed as a transitional alphabet, as an "initial device to grade the difficulties of written and printed language in order to help the child read the traditional orthography of English (Downing, 1964, p.x). In i.t.a., the appearance of English graphemes were changed to those of the Augmented Roman Alphabet (Downing, 1964, p.15), each grapheme

matching as far as possible the forty or so phonemes of English. The guiding principles were:

> [1] The alphabet is augmented with additional characters for those phonemes which have no letter of their own in t.o. [traditional orthography].
>
> [2] Gross irregularity in t.o. is removed.
>
> [3] Its deliberate design as a transitional alphabet. It is extremely important for the understanding of the i.t.a. experiment that this special characteristic be emphasized, because a number of misconceptions may arise if it is not recognized that i.t.a. is deliberately designed to help children to transfer their training in reading i.t.a. to t.o. (Downing, 1964, p.x).

No effort was made to change the method of instruction:

> i.t.a. is not a method of instruction. It is a way of grading the difficulties of print and it can be used with any method of reading instruction (Downing, 1964, p.xvi).

Other than learning the i.t.a. alphabet, the teacher was to proceed in the conventional manner.

The initial reports were very supportive of the usefulness of i.t.a. in regular classes as well as in a variety of special classes. Some i.t.a. classes were started in Canada and the U.S.A. But, on the whole, i.t.a. did not capture much interest on the North American continent. Although i.t.a. increased the regularity of the grapheme to phoneme relationship, which was looked upon as of paramount importance (Downing, 1963, Pidgeon, 1979), the importance seems not to have been emphasized. The purpose of the alphabet was probably

misunderstood in North America. It appeared to be contrary to all the conventional methods, and little effort seems to have been made to clarify its rationale. The reasoning behind i.t.a. may have been too new. The i.t.a. symbols may have looked too bizarre, appearing to add to confusion rather than dispersing it. The phoneme was an unfamiliar concept and there was little, if any, discussion in the conventional reading instruction manuals about phoneme to grapheme relationships in beginning reading. Whatever the cause, i.t.a. did not become an accepted approach to reading instruction in North America.

The British Government's Bullock Commission (Department of Education and Science, 1975) was aware of the results of the i.t.a. reading experiment and of the fact that:

> One-and-a-half school years after starting to learn to read the new alphabet, the i.t.a. pupils achieve significantly superior scores on tests printed in the traditional alphabet and spelling. The children who began with i.t.a. and later transferred to t.o. have read the latter with greater accuracy and comprehension than children who have been learning with t.o. from the outset. ...We have analysed the results of administering the Schonell Graded Word Reading Test in t.o. to both experimental and control groups in the course of their third year (chronological age 7.1 years). The mean score for i.t.a. pupils (this includes some who were still on i.t.a. readers) was 34.4 (the norm for age 8.4 years), as compared with only 24.1 (norm for age 7.4 years) for children who started out with t.o. Thus, a conservative estimate of i.t.a.'s effectiveness for the average pupils is that it saves one year in learning to read t.o. (Downing, 1964, p.xxviii-xxix).

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Their recommendations for i.t.a. were:

> (1) Schools which choose to adopt it should be given every support.
>
> (2) We also feel that teachers should examine the question of i.t.a. on its own merits (A Language for Life (Bullock Commission Report) 1975, cited by Downing, 1979, p.80).

Downing (1979), reconsidering the theoretical implications of the effectiveness of i.t.a. adds that:

> ...the simpler system in i.t.a. makes it easier for pupils to understand the task of learning to read. Also the greater frequency with which the same i.t.a. symbol represents the same phoneme probably facilitates the development of linguistic awareness during the time when the pupil is having his first experiences in reading instruction. This, in turn, makes it easier for the child to conceptualize the abstract phoneme unit. In other words, the use of i.t.a. print is one way of fostering the child's cognitive clarity about one of the technical concepts of literacy (Downing, 1979, p.91).

Another program related to phoneme theory, this one initiated in the U.S.A., was the Open Court Reading and Language Arts Program begun in 1969. It began as a help to children of Creole and Spanish speaking backgrounds to aid them in beginning reading or in the remediation of reading difficulties. Open Court has always called itself "phonic." The research for the program was done in 1965 by Gurren and Hughes as a rigorous comparison between "intensive phonics" and "gradual phonics" to answer the following question:

> Does the intensive teaching of all the main sound-symbol relationships, both vowel and consonant, from the start of formal reading instruction, have a beneficial effect on reading comprehension, vocabulary and spelling (Gurren and Hughes, 1965, p.339).

In "gradual" or "conventional" phonic methods the teaching of some vowel sounds and some consonant sounds is delayed until the second grade according to Gurren and Hughes (1965, p.340). Intensive phonics is defined in their question. They tabulated the findings of 22 studies in terms of significant differences:

> On the basis of this tabulation, 19 comparisons favored intensive phonics, three favored neither method, and none favored gradual phonics. The reviewers conclude that early and intensive phonics instruction tends to produce superior reading achievement. They recommend that vowel sounds as well as consonant sounds be taught intensively from the start of reading instruction (Gurren and Hughes, 1965, p.339).

This is the research evidence cited to support the Open Court Reading and Language Arts Program. No other independent evaluation of the program has been made.

Open Court publications has expanded the program but its foundations in phoneme concepts has remained. In their current catalogue under the title "Phonics Kit" are the "Wall Sound Cards," which introduce the letters of the alphabet, their sounds and spellings. These cards present the basic sound-symbol relationships and serve as a consistent reference for reading and spelling. (Open Court Catalogue, 1980-81, p.16). "Phoneme" is never mentioned and yet the 43 wall charts and the organization of the Open Court phonics program match the phonemes of English. Each card represents one phoneme and on it is a picture showing some action matching the sound, e.g. /s/ is the hissing of a tire going flat and listed below are the common grapheme forms, s, ci, ce, cy. The one-to-one

matching consonants like m or b have only one letter below the picture. This system uses the concept of phoneme without making any changes in the appearance of the letters. Its method of instruction is strongly "phonics-based decoding" (Open Court Catalogue, 1980-81, p.10), expecting children to become independent readers in the first grade. Its approach is in contrast to i.t.a., for it changes the instruction method rather than the alphabet. It advocates its own version of "phonics" instruction methodology.

Another phonemic program has just been reported by Lopez (1981). The recent restructuring of elementary education in Cuba has created the need for an appropriate readiness program for preparing children for primary school. At the Central Institute of Pedagogical Sciences in Havana, much work has been based on Elkonin's findings.

> The analysis of the different stages which characterize the formative process in teaching reading in the first grade (Elkonin, 1962) and in infant centers (Zhurova, 1974) has led us to develop a reading readiness program which takes into account the nature of the Spanish language and the characteristics of our first grade reading program. The main objective of this readiness program is a general orientation to the phonemic system of Spanish (Lopez, 1981, p.235).

The Cuban educators have used activities providing concrete representations of sound, building a model of a word and analysing its sequence of sounds. No printed words or letters are used in this program. In the first stage, identical blank cards, one for each phoneme, are used.

> Phonemic analysis is accomplished by having both the teacher and the students use a pointer to indicate the particular sound in the card model of the word and emphasizing that sound in its pronunciation (Lopez, 1981, p.237).

In the second stage, the blank cards are colored blue for consonants and pink for vowels. The analysis proceeds in the same way as described above, except that this time, in addition, the colors make the distinction between vowels and consonants. When the child is capable of this kind of phonemic analysis, they begin teaching the transforming of one word into another (English example: "pan" into "nap"). Another method involves considering real objects (English example: "book" into "look"), analysing the sounds and then changing one phoneme to make another word. These purely oral games are also said to be effective in improving pronunciation of the language.

The Cuban report concludes:

> The results of this pilot program were positive. Then, the program was implemented in 40 classrooms with similar results. On this basis, we concluded that this program and its underlying principles are appropriate for use in preparing children for the first grade reading activity. As a consequence, it was adopted for use in all of our pre-schools (Lopez, 1981, p.239).

Their final note is that additional research is necessary to determine exactly what effects this program has on subsequent reading achievement.

Overview of the History of Teaching Methods in the Soviet Union

Nazarova (1982) has written a brief account of the history of methods of teaching in the Soviet Union and of the educational problems that faced Russia after the October Revolution of 1917. In delineating the factors leading to the choice of methods and materials for teaching reading at that time, it was noted that even before the Revolution, Krupskaia, an eminent teacher, had expressed the idea that:

> there should be one comprehensive school for everyone, preparing all children for both physical and mental labour, and for an insight into life that would illuminate their existence (Krupskaia, from Pravda, May 18, 1917, as cited by Nazarova, 1982, p.4).

These seeds of a more progressive educational approach were already there but, as regard the majority of schools, the "Soviet authorities inherited a school system that was steeped in official theories that supported stereotyped teaching approaches" (Nazarova, 1982, p.5). There was an urgent need to teach all children of school age, as well as adolescents and adults. A number of different primers were published and they:

> relied both on pre-Revolutionary experience in teaching literacy by the phonetic analytical-synthetic method, the traditional syllabic method, and also on new theoretical principles justifying the use of the whole word method (Nazarova, 1982, p.18).

Much disagreement over methods and materials continued but finally, out of necessity, all methods were used. Although phonics methods were relatively effective, new enthusiasm swept in the "teaching wholes"

method as a means of developing the "children's potential to act and create freely" (Nazarova, 1982, p.23). And so, the educational battle of the 1920s was waged against the traditional phonetic analytic-synthetic method by the defenders of the "scientific" base of the whole word method and by another group who advocated the "Living Sounds" phonetic method. Vakhterov, an influential teaching specialist of that time, commented that many teachers were hostile to the "whole word" method. He, too, objected to this method:

> Further, Vakhterov explained that the Americans have one justification for applying the whole word method. That is the properties of the English language. But the Russian supporters of this method do not have this justification. The whole word method is quite inappropriate for an alphabetic writing system (Nazarova, 1982, p.30).

In the 1930s the "unsuitability of the whole word method for teaching reading in the Russian language was becoming increasingly evident" (Nazarova, 1982, p.47). The argument continued but the phonetic method as such, was not revived. Research departed in many different directions and their findings led to new debate on the pages of the educational journals. Nazarova ends with a comment on the current situation that:

> the chief issues that have been pursued in recent years have been those of the essential process of sound analysis and the correlation of sound analysis and reading (D.B. Elkonin), studying children's individual differences in mastering reading and writing (S.P. Redozubov and L.K. Nazarova) and the quest for the best primer content based on the principle of the frequency of letters in contemporary Russian writing (V.G. Goretsky, V.A. Kiriushkin and A.F. Shanko). (Nazarova, 1982, pp.51-52).

It is interesting at this point to turn to Elkonin's review of Soviet research on the fundamental psychological processes involved in learning to read Russian. He also commented that the "new phonetic method" introduced about one hundred years ago was still not satisfactory:

> Teachers who employ the contemporary so-called analytic - synthetic sound approach are able to teach children to read in a relatively short time.
>
> Yet the criticism of this method still does not cease. Censure comes from practical workers, as well as linguists and psychologists (Elkonin, 1973, p.551).

This brief look at Soviet educational history can be used as a match to the similarities in our teaching methods history. Although they are continents and ideologies apart, the American and Soviet educational systems seem to have very similar problems. Both have been trying to improve the methods of teaching reading. Both languages are complex and do not have a one to one correspondence of phonemes and graphemes.

In considering the English language first:

> As is well known, there are 24 consonants (16 obstruents, three nasals, two liquids, and three glides (including /h/)). The consonant inventory is well established and constant for most dialects of English. The inventory of vowel phonemes varies somewhat according to interpretation. For example, application of certain principles could reduce Hockett's 14 contrasts to eight vowel phonemes by regarding a diphthong as a combination of vowel and consonant, rather than as a unitary phoneme. For British English, according to A.C. Gimson (An Introduction to the Pronunciation of English), London, Edward Arnold, (1964) there are 21 vowel contrasts (phonemes), including the diphthongs (Warkentyne, 1981).

Using Gimson's 21 vowel contrasts (phonemes) and the consonant count of 24, the total count for English is 45 phonemes. There are only 26 letters in the alphabet. The inequality is clear.

In discussing the Russian writing system, Elkonin states that:

> correlations between the phonemic and graphemic systems seem to have become rather complicated. The number of characters that mark the consonant phonemes are considerably fewer than the phonemes. Each consonant character, with a few exceptions, marks two phonemes--a hard and a soft one. Thus, a consonant character by itself does not reveal which phoneme it marks. The choice between a soft phoneme or a hard one is determined by the next vowel. Vowel phonemes are marked by a great number of characters. Some characters mark a vowel phoneme plus the hardness of the preceding consonant; others mark the same vowel phoneme but the softness of the preceding consonant phoneme (Elkonin, 1973, p.573).

From our standpoint, it is important to note that English is an alphabetic language. There is no more justification for the whole word approach as a reading method for English than there is for Russian. Elkonin has taken a different approach. He discusses phonemes and phonematic hearing as the basis of developing procedures for modelling the structure of language. The child manipulates concrete objects such as wooden blocks and matches them to the phonemes of speech and thus the child can see a model of sound in concrete form. Elkonin's theory and procedures are described in more detail in the next section.

Elkonin's Reading Theory and Procedures

At the international level in the literate countries there has been a growing interest in effective methods of teaching reading. The UNESCO survey by William S. Gray (1956), The Teaching of Reading and Writing, looked at the problem of world illiteracy and attempted to help developing nations wanting to improve or start reading programs. But the findings of research at that time showed no conclusive evidence to support any one method as being superior to others. This may have been because:

> Only a few of the many methods have been studied experimentally, and then this was not always done with sufficient care to ensure that the differences in results were due solely to variations in teaching methods (Gray, 1956, p.101).

In 1973, a "Comparative Reading" project was conducted in fourteen countries to obtain a broader perspective from which to assess various methodologies. Representatives of the participating nations reported on the state of their country's reading programs, achievements and current problems. The result of this survey was Downing's (1973) book, Comparative Reading. In it, D.B. Elkonin described his research and explained his phonematic hearing theory of learning to read. Elkonin's description of the reading problem follows:

> The final problem of reading is comprehension. In various writing systems, the comprehension of written language occurs as a result of different processes. With pictographic or ideographic writing, where the illustration or symbol marks the concept, comprehension is the result of the direct connection between the symbol and its designated meaning. In

> alphabetic writing systems constructed on the basis of writing a character for a speech sound, a direct connection between the graphic form of written words and their meaning in the language does not exist. Therefore, to all people with normal hearing, the understanding of reading in such writing systems is realized on the basis of the sound formation of the word, with which the meaning also is connected. In principle, the understanding of the written, as well as the oral language, takes place on the basis of the sound formation of the word. In reading aloud the connection between understanding and the sound formation of the word is obvious. In reading silently, also, the understanding depends on the sound form of the word, but only as a sound image. No matter how the written word is perceived visually, whether it be perceived as a whole, in syllables, or letter by letter, the understanding is based on the sound formation of the word....
>
> The fact that experienced readers anticipate the material read, on the basis of understanding the preceding text, does not reduce the importance of the part played by the sound formation of the word in comprehension. Such anticipation merely creates the conditions for a quicker rendering. Despite the fact that people often advance the comprehension of a word as a criterion of its correct reading, understanding is not an essential part of the process of reading. It is rather to be regarded as a facilitating or complicating factor. In this view, a word can be read correctly, though not understood. For practical purposes, a reader turns to the dictionary for the meaning of a written word that has been correctly recreated in its sound image (or spoken form) because for the reader there is no meaning associated with that sound image. When all the words in a text are already known, the reader uses his own internal dictionary, in which he finds the meaning of the words read (Elkonin, 1973, p.552).

For Elkonin "reading is the creation of the sound form of the word according to its graphic model" (Elkonin, 1973, p.559) and, in the beginning stages of learning to read, comprehension functions for

children as a self-checking device that tells them if they have correctly created the sound form of the written word:

> It is important to remember that the purpose of ideographic writing is to directly symbolize meaning, whereas alphabetic writing is aimed at symbolizing the sound forms of words (Elkonin, 1973, p.558).

Children may learn to read an alphabetic language such as English or Russian by moving directly from the graphic forms to meaning but then the ability to decode unknown words by sound analysis is closed to them. There will be little understanding of the relationship of the structure of language to its graphic forms nor will they have the tools to become truly independent readers.

Thus, it may be argued that if reading behavior is dependent on the sounds of language, the teaching of reading needs to begin by revealing the sound structure of the spoken words - not only the basic sound units of language but also how language is constructed from them.

> The phoneme is not a simple sound governing particular acoustic and articulatory properties. It is a sound that belongs to a definite system of phonematic contrasts. The essential distinction that must be made in this regard is between the perceived phonemes of a language and their embodiment in the natural flow of speech. It was this conclusion in particular that led us to recognize the necessity for replacing conventional phonic analysis, which has the objective of teaching the sounds of letters, by phonematic analysis which aims at giving children an understanding of the phonematic system of language (Elkonin, cited by Downing, 1978, p.12).

Elkonin thus eschews the phonic method, which teaches each sound separately, immediately attaching it to the letter it represents, and then leaves aside any further teaching of the auditory aspect of language. He provides instead a system of teaching in which the sound structure of the word must be disclosed to the child before he learns letters and the subskills of reading (Elkonin, 1973, p.556).

In Elkonin's theory, phonematic hearing, the auditory discrimination of separate speech sounds, is the first step in preparation for learning reading and writing skills. The skill of sound analysis need to be learned prior to the presentation of reading itself:

> The full skill involves not only the ability to discriminate between the total sound form of separate whole words, but also the ability to distinguish clearly individual sounds and words as separate units.
>
> Of no less importance is the ability to hear the temporal order of the series of sounds in a word. A word does not consist simply of a complex of sounds. Different words can consist of the same sounds, but differ still in the temporal order in which the sounds occur. It is extremely important not only to be able to detect the presence of a particular sound in a word, but also to have the ability to determine its exact position--that is, which sound occurs before or after another sound as well as the general order of the succession of sounds (Elkonin, 1973, p.557).

One reason that Elkonin gives for asserting that phonematic hearing and the analysis of sounds needs to come before the letters of the alphabet are introduced is to prevent the confusion caused by the child thinking that the sound and the letter name are the same.

The printed character, the letter, can more readily be regarded as a concrete object by the child and this causes children to distort the true relationship between spoken language and written language. They either consider the sound to be the name of the character or consider the name and the sound to be interchangeable. Either way, it leads to serious misconceptions.

It is Elkonin's premise that the "final problem of reading is comprehension" (Elkonin, 1973, p.552) and that the understanding of the written as well as the oral language takes place on the basis of the sound formation of words. To Elkonin it is clear that the problems discussed can only be resolved by a change in teaching method. Phonematic hearing needs to be developed in such a way that the "child discovers the basic principle of constructing the sound form of words" (Elkonin, 1973, p.559). A new method of working with sound is necessary. It has to avoid the use of letters in its initial stages and needs to improve phonematic hearing. Such a method was devised by Elkonin and it was begun with the realization that learning to read was a skill and needed to be considered from that viewpoint. He looked at the adult level of the skill first and noted that:

> The arrangement of a succession of sounds in a word, as well as the discrimination of a single sound in a word, seems an extraordinarily simple act for a normal literate adult. This illusion arises from the fact that, at this higher level of development, the operation occurs by then as abbreviated, generalized, perfected, and automatic mental behaviour, which requires no effort and causes no problems. But the truth is that this is only the final form of the process of sound

> analysis of a word. For teaching, this final form is the goal that has to be achieved, progress toward which must follow a certain path for the development of the ultimate process anticipated. The basic position of psychology here is that learning a new skill cannot, and, consequently, must not start from its final form; that mastering the skill does not consist in becoming gradually attached to one or another spontaneously given form, but on the contrary, proceeds by consistent changes of its form from the initial stage to the final mental form (Elkonin, 1973, p.559-560).

Elkonin states that Soviet educational psychologists "have accepted Galperin's thesis that the entirely mental operation can only develop if learning to perform it proceeds in a certain series of stages, namely:

1. Establishing a preliminary conception of the task.
2. Mastering the operation with objects.
3. Mastering the operation at the level of overt oral speech.
4. Transferring the operation to the mental level.
5. Operating at the entirely mental level" (Elkonin, 1973, p.560).

Using Galperin's theory, Elkonin created a method of teaching phonematic hearing sub-skills. First of all, the procedure is oral and is carried out prior to learning the letters of the alphabet. The cognitive phase begins with thinking about sounds and the fact that they can be separated and then joined together to produce "words" that have meaning. This process is demonstrated and modelled for children so that they can think about words and sounds and meanings. Finding a method for the second phase, mastering the operation with objects, was more difficult. Eventually the method of using plain one-colored blocks for phonemes was found. This procedure consists

of saying each word aloud in a slow drawl and placing a block for each phoneme as it is segmented in the word. At first, the child has three aids, a picture, a diagram of a row of squares each representing one phoneme in the word, and the blocks. Beginning at the left, a block is pushed into each square as each phoneme is uttered:

> These conditions helped the child in several ways. The picture reminded him of the word that had to be pronounced and analyzed, and the diagram showed how many sound elements had to be found in the word's construction. This led the child to produce behaviour that was practical in operation: separating sounds on the basis of specially organized uttering and modelling the succession of sounds in the word. Filling the diagram with counters for the sounds appeared to the child as a model of the sound construction of the word. It demonstrated in material form the succession and number of sounds in the task word (Elkonin, 1973, p.562).

The next part of the mastery phase continues with overt oral speech, segmenting words into phonemes, but withdrawing the aids one at a time. In this order of increasing difficulty, the child uses the blocks but the squares are no longer included. The child has to analyze the words into the right number of phonemes without the help or the reassurance of the squares. The next step is to remove the picture and to use only overt sounds and the blocks. These steps are demonstrated first, before the children do it by themselves. Next, the sound segmenting is reduced to a whisper and then to silent mental analysis. This stage seems to occur quite naturally and easily as soon as the child feels comfortable with the process. In the fifth or final stage, the whole process is mental. The segmentation analysis is internal and the child simply states how many phonemes the word contains.

This procedure models the sound image of the word in the correct sequence, so that the structure of language is made clear to the child. When oral segmentation has become fluent, the child will be ready for the next step in learning to read. This step consists of matching the phonemes, which can now be readily identified, to the graphemes of the language.

Research Related to Elkonin's Work

There are two areas of research directly related to Elkonin's theory of reading that will be considered here. The first one is the letter-name versus letter-sound controversy in reading education and the second one is the psychological research on skill acquisition.

In the U.S.A. particularly, there is a continuing strong emphasis on teaching children the names of the letters before and/or when they go to school. Samuels has reviewed the correlational and experimental evidence regarding this practice in his article "Letter-name Versus Letter-sound Knowledge in Learning to Read." He concludes:

> The failure of experimental studies to find that letter-name knowledge facilitates word recognition leads one to suspect that the correlational findings between letter-name knowledge and reading may be a product of some other factor such as intelligence or socio-economic status. None of the correlational studies controlled for these variables... (Samuels, 1971, p.608).

More recently, Samuels (1979) has maintained his position and this is in agreement with Downing's (1979) cognitive clarity theory which holds that difficulties in reading are sometimes the result of

students' not comprehending the teacher's instructions. "Technical terms such as sentence, word, read, and second (ordinal position) may be unknown concepts to the student (Samuels, 1979, p.5). In discussing beginning reading difficulties, Samuels adds the further thought that, "Too often the origin of the ailment is iatrogenic--a physician produced illness, only in this case it is school produced" (Samuels, 1979, p.7). Further support and clarification comes from Downing (1973). In Comparative Reading his discussion "Linguistic Environments I" draws upon Piaget and Vygotsky:

> As Piaget has pointed out, "Verbal forms evolve more slowly than actual understanding." Hence letter-name knowledge in kindergarten is probably a symptom of development in an early phase in the growth of cognitive clarity (Downing, 1973, p.211).

But the teaching of letter names does not do anything to enhance the understanding of language structure or the relationship of sounds to letters. From the writings of Vygotsky (1934), Downing quotes:

> Direct teaching of concepts is impossible and fruitless. A teacher who tries to do this usually accomplishes nothing but empty verbalism, a parrotlike repetition of words by the child, simulating a knowledge of the corresponding concepts but actually covering up a vacuum (Downing, 1973, p.211).

Downing then applies Vygotsky's general principle of concept development to letter concept learning in particular:

> More specificially, rote learning of the letter names is a useless activity, if our aim is to develop the fundamental linguistic concepts the child needs for learning how to read and write....

> It is possible that formal, direct teaching of letter names may have a result worse than the "vacuum" in the child's mind suggested in the quotation from Vygotsky. For example, learning the name of something one does not understand or even recognize as actually existing in reality may increase the child's insecurity, uncertainty, and confusion about the task of learning how to read and write. This is one possible explanation of Muehl's finding that "the acquisition of letter-names by kindergarten aged children interferes with subsequent performance in learning to associate picture names with nonsense words containing these same letters as the critical stimuli (Downing, 1973, p.211).

A further reason for avoiding the naming of letters prior to learning to read is that "blending" problems also may be caused by this practice:

> The so-called "blending difficulty" arises when children try to construct the sound form of words not out of the sounds of language but from what they think are the names of the characters. In their "blending" difficulties they demonstrate that their behavior is inappropriately oriented toward the characters they are attempting to name instead of the realities of the sounds of language (Elkonin, 1973, p.554).

In the author's opinion there are two "blending" difficulties. One arises during the course of teaching blends and the other in the child's efforts to analyse and read new unknown words. The necessity for teaching blending comes from the previous teaching, which is fragmentation. Children are often taught to separate only the first sound of a word. No further segmentation is done. Then later (possibly very strangely from the child's viewpoint) some sounds have to be joined again: but still, not all the sounds of the words,

just isolated two or three consonant blends are joined in a "blend." The sequential organization of sounds in a word is glossed over and often, so is the blending to fluency. Some teaching may not include the idea that each word must be said smoothly and quickly enough to become an understood entity before the next word is considered.

From this author's experience in teaching children in Learning Assistance programs, this letter-name versus letter-sound error is at the base of many learning to read problems. The child is confused about names and sounds and establishes a very mixed and erroneous system for analysing new words that are to be decoded. Sometimes, the analysis is not too far wrong but they are unable to hear the real word because they do not continue the blending of sounds to the point that it resembles normal fluent speech and thus to the recognition of the word's meaning. It is also important that the whole sentence is read aloud fluently so that the meaning becomes clear. The purpose of the written code is clear only when it is understood.

The second area of consideration to be related to Elkonin's work is the psychological research on skill acquisition. This word "skill" must be considered more closely when it is applied to reading. Galperin's theory, discussed earlier in this thesis, is close to the one stated by Fitts and Posner (1967) in their review of psychological research on skill learning. They concluded that "skill" has:

> three phases of development. The first phase is the cognitive phase in which the learner attends closely to the functions and techniques of the various tasks he must undertake to become a skilled performer. He tries to find out what behaviour is relevant and what is irrelevant

> for performing the skill. In more complex skills there may be a considerable effort involved in understanding the tasks set for the learner. The second phase is the mastering phase in which the skill is practised until mastery is gradually achieved. The third phase is the automaticity phase when the learner practises beyond mastery until he can perform the skill without any conscious concern for it (Downing, 1979, p.34).

The similarity to Galperin's five stages can be seen more clearly by repeating them here:

1. Establishing a preliminary conception of the task.
2. Mastering the operation with objects.
3. Mastering the operation at the level of overt oral speech.
4. Transferring the operation to the mental level.
5. Operating at the entirely mental level.

Galperin's "preliminary conception" seems to parallel the "cognitive phase" of Fitts and Posner. Galperin's stages 2 and 3 include the word "mastering" as in Fitts' and Posner's second phases, "mastering." Galperin's "transferring" process may be an intermediate stage on the way to automaticity, which seems to be implied by his description of the fifth and final stage.

Downing and Leong (1982) recently completed a survey of psychological research on skill learning in order to apply it more closely to reading. They decided that they would:

> first of all, summarize what psychological research says about skill learning in general and then, secondly, go on to relate it to the specific skill of reading. We are deliberately keeping these two steps quite separate for a very good reason. First, we want to establish as starkly as possible the conclusions that psychological research has reached on skill learning in general. Then we can compare these conclusions about skill in

> general with descriptions of reading behavior in particular to see if reading fits well into the psychologists' category of skill. If it does, then all psychological findings on skill learning can be applied to the acquisition of reading. Many general findings may have been overlooked by reading teachers (Downing and Leong, 1982, p.14).

From the several definitions of "skill" that were given, McDonald's (1965) definition was considered a "good example of the generally acceptable text-book descriptions of the behavior categorized as "skill" (Downing and Leong, 1982, p.14). McDonald emphasizes that it is not merely a matter of motor behavior but also of understanding. Briefly his definition is:

> The total performance...is a complex set of processes--cognitive, attitudinal and manipulative. This complex integration of processes is what we usually mean when we refer to "skill" (McDonald, 1965, p.387).

Downing's and Leong's list of characteristics of the performance of a skill is a consensus of a wide range of psychological research reports and reviews. They found "twenty-one major generalizations about the acquisition of skills in general that an eclectic psychologist would be likely to accept" (Downing and Leong, 1982, p.28). Then they continued with their proposed second step, the comparison of these conclusions about skill learning with the descriptions of reading and learning to read behavior.

> We found that the fit is very good. Therefore we conclude that psychological research findings on skill acquisition in general can be applied with confidence to the specific skill of learning to read (Downing and Leong, 1982, p.28).

Thus there is general agreement that reading is a skill and, therefore, it is appropriate to consider its processes in this light. Elkonin's theory of the development of phoneme segmentation as a subskill of the learning to read process is in accord with the skill development theory.

As noted earlier in this section, Elkonin is much concerned with the misuse of letter-names in place of sounds. The first tenet of the skill theories discussed is the need for the skill learner to understand the task. Elkonin's methods for developing phonematic hearing and the sound image of the word by the use of concrete materials would help to clarify the difference between the two concepts, the name of the letter and the use of the symbols for sound in relation to writing and reading. This would establish the first cognitive step in the skill of learning to read and write.

Linguistic Awareness Tests

A number of tests have been created that attempt directly or indirectly to measure some aspect of language awareness. Most commercial standardized reading tests and reading readiness tests have sub-tests which require sound analysis as a measure of "phonic" ability. Most of them test children's knowledge of letter to sound relationships. They do not claim to test linguistic knowledge directly.

There are two tests available currently which attempt to measure children's metalinguistic knowledge. One of these is Clay's (1972) Concepts About Print Test, also titled SAND. The other one is the

Linguistic Awareness in Reading Readiness Test or LARR Test (Downing, Ayers and Schaefer, 1982).

The SAND Test is for early detection of reading difficulties and tests the child's knowledge about the concepts of print. It is designed to be used after the child has had some reading instruction and when he/she appears to be running into difficulties in learning to read. It is suggested that this individually administered survey be carried out after one year of reading instruction. It is a diagnostic test of the child's understanding of technical concepts of print and the summary sheets shows the score by error rate. It is not a test of oral reading nor does it test any sound analysis ability.

The LARR Test also measures the child's knowledge of concepts of print in its third sub-test, but the first two sub-tests measure the child's knowledge of concepts of acts of reading and writing and their purposes. As such, it goes further into the linguistic awareness area of beginning reading by finding out if the child understands what reading is. The LARR battery is a simple paper and pencil test that can be readily administered to groups of pre-schoolers even if they cannot read or write. Because it can be given to non-readers and be group administered, it would seem to be a very useful test to give at the beginning of grade one, as it would show which children needed instruction in these areas, and it would also show the extent of knowledge of the concepts of print for those children who were at a higher level. As any effective test should do, it also points out to the teacher those areas that may require attention. However, the LARR

test considers many linguistic concepts but it does not test the child's understanding of the phonemic basis of spoken language.

As has been pointed out earlier in this thesis, there is a particular need to have a test which evaluates phonemic concepts. It is needed for the practical teaching purposes mentioned in this thesis' description of the background to this study, and more specifically, it is needed as a research measure for the experiment to be reported in Chapter IV. Hence, a new test needed to be constructed to fulfill the aims of this study. The construction of this new Phoneme Segmentation Test will be described in the next chapter. A whole chapter is devoted to this test development because that work was one of the main aims of this study and because its description is essential for other investigators who may wish to replicate this study starting from its initial foundations.

CHAPTER III

DEVELOPMENT OF THE RESEARCH INSTRUMENT-- THE PHONEME SEGMENTATION TEST

Background to the Test's Construction

The research to be reported in this thesis stemmed from its author's work started in 1978, when she was teaching in elementary schools as a Learning Assistance Teacher. Phoneme segmentation sub-skills were taught to a kindergarten class in late spring because the teacher had observed that the children were unsure of the sounds of English. For some of the pupils, English was a second language and, for others, home English was quite at variance with standard English. The kindergarten teacher's view was that these children's knowledge of English speech sounds needed to be improved before the children entered grade one in the fall. For these reasons, the present author gave three individual twenty minute phoneme segmentation lessons to each pupil. Although only informal methods of assessing and recording progress in phoneme segmentation were available, the results seemed encouraging. No follow-up study was made of this class.

At the same time and in subsequent years, phoneme theory was applied in speech segmentation activities as the basis of a great deal of remediation of language difficulties of many children who were referred for Learning Assistance. Open Court Publications wall cards and hand cards, which present one phoneme per card, were one of the aids used to meet individual needs in spelling or reading. Many instances of improvement were observed.

But the lack of a direct test of phoneme recognition or segmentation ability was a continual frustration. Various language assessment instruments included sub-tests on sounds but these were not sufficiently close to the concept of phonemes to be suitable. Furthermore, the employment of only small parts of tests was expensive and cumbersome. What was needed was a brief, easily administered test that gave direct information on a child's awareness of phonemes. It had to be simple enough to use in kindergarten and yet have sufficient range to extend to the end of grade two, so that it would provide for the broader area of Learning Assistance work.

This author's consciousness of the lack of any existing test of children's phoneme awareness in the practical work of Learning Assistance teaching guided the design of the research for this thesis. It was clear that, before any experiment could be conducted on the effects of teaching phoneme segmentation, an instrument for measuring any such effects would need to be constructed. Thus the research to be reported in this thesis fell into three stages: (1) construction of the phoneme segmentation test; (2) pilot study of the suitability of the test; and (3) the final experiment of the effects of teaching phoneme segmentation as measured by the test created and developed in stages 1 and 2. The first two stages are reported in this chapter. The experiment will be reported in Chapter IV.

Construction of the Phoneme Segmentation Test

The initial attempt to create a direct test of phoneme segmentation was made in the fall of 1980 and a pilot study on the suitability of its words and its range was conducted in December of that year. The main purpose of this study was to determine the words to be used in the Phoneme Segmentation Test and to ascertain whether the range of words was wide enough.

The rationale for the construction of the test came from Elkonin's (1973) theory of phonematic hearing and phoneme segmentation and from the conclusions drawn by Fitts and Posner (1967) from their review of research (i.e. the three stages of skill development; cognitive, mastering, and automaticity). These have been described in Chapter II of this thesis. This author's experience in teaching phoneme segmentation also affected the contents of the Phoneme Segmentation Test.

The first version of the Phoneme Segmentation Test consisted of a preliminary practice section followed by the actual test which had six Parts, namely A, B, C, D, E, and F. Each of these Parts began with representations of short, simple words and progressed to longer, more complex ones (Note: "words" here refers to the names of the objects represented--not to written or printed words). In Parts A and B, pictures of everyday objects and actions represented the words. In selecting the words for representation, the first choice of phonemes was made on the basis of the following criteria. The consonants employed matched the sounds listed by Flowers as representing "40 per

cent of the sounds as they occur in language--high frequency sounds--t, x, m, z and r, l, n" (Flowers, 1980, p.8). Some short vowels and dipthongs were included. Another specification was that /s/ for plurals was needed. The consonant blend /nt/ was included because it had been noted by the author that children often had difficulty hearing or separating this blend. For Part A, single syllable CV (consonant and vowel) CVC, CVCC words were chosen. Two syllable and multisyllable words were added in the later Parts. A manual of instructions for the administration of the test was also prepared. These test materials and administration procedures are described below.

Test Materials

Practice Section: The materials were nine plain single-colored one inch wooden blocks (cubes) and 1 picture card showing an egg cracked out of its shell. This card was an 8" x 14" piece of white cardboard with a colored picture of the egg pasted on it. The picture depicted only the spoken word "egg." On the card below the picture, was a diagram of two squares adjoining one another. These squares were slightly larger than one side of the blocks.

Part A: The materials were the same nine wooden blocks plus eight picture cards made the same way as described above, with the diagrams of squares on each of them to match the number of phonemes of the stimulus words. The words were one-syllable nouns, two to

four phonemes in length totalling 26 phonemes. The words, in order, were: "bike," "boy," "mat," "cake," "bread," "door," "milk," "girls."

Part B: The materials were the same wooden blocks plus ten picture cards with no diagrams on them. The words were nouns of two to six phonemes in length, some being two-syllable words, totalling 37 phonemes. The words, in order, were: "dog," "cow," "pants," "baby," "eye," "fish," "kitty," "boot," "slippers," "runners." Figure III-1 shows an example of the picture card "dog."

Part C: There were no concrete materials. Eleven words were presented orally by the examiner for oral segmenting by the child. The words were either nouns or verbs of three to eight phonemes in length containing up to four syllables, totalling 47 phonemes. The words, in order, were: "mouse," "thumb," "chair," "toy," "dress," "shoes," "whistle," "lunch," "scamper," "elephant," "thermometer."

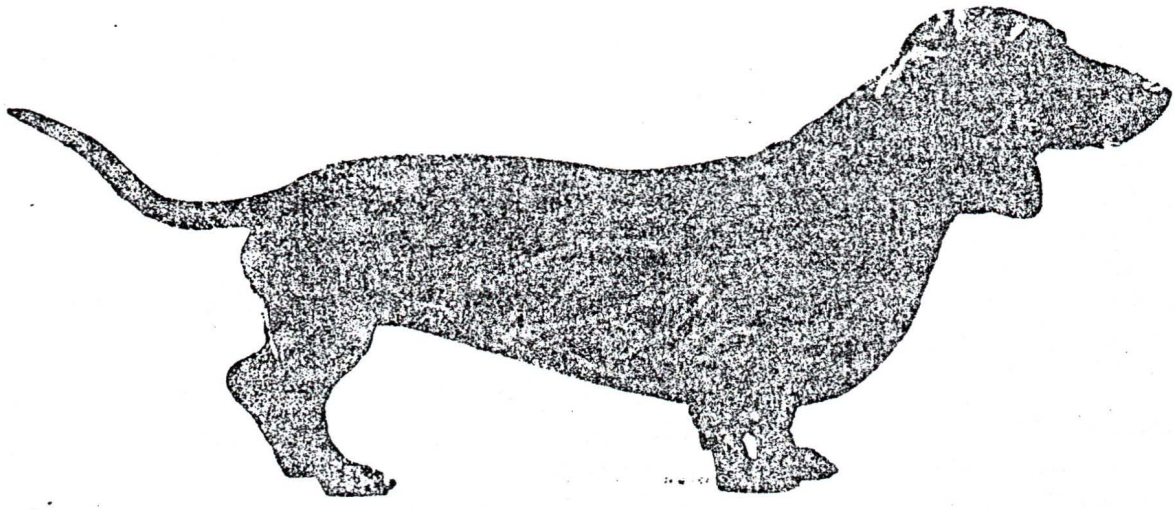
Part D: There were no concrete materials. Twelve words were presented orally by the examiner for oral segmenting by the child. For each word separately the child was to state the number of phonemes in the word. These twelve words were a selection of nouns and verbs, either concrete or abstract, two to seven phonemes in length, and one to three syllables per word, totalling 51 phonemes. The words, in order, were: "mud," "joy," "think," "open," "love," "upon," "forget," "puddle," "reading," "table," "happiness," "raining."

Part E: There were no concrete materials. Eleven words were presented orally by the examiner for the child to calculate the number of phonemes in the word. The words were all conjunctions and were two to five phonemes in length. The words, in order, were: "if," "the," "and," "since," "because," "so," "yet," "in," "when," "once," "either."

Part F: There were no concrete materials. Ten nonsense words were presented orally by the examiner for the child to calculate the number of phonemes in the word. The words, in order, were: "ud," "wes," "tuz," "amp," "wiget," "sisna," "ontigoo," "mithler," "zamlen," "datiblot."

Procedure for Administering the Test. The test was individually administered in a quiet room with no other people or distractions present. The examiner went to the classroom to get the child or sometimes the first child escorted the next one to the testing room.

In the practice session, Elkonin's method of teaching phoneme segmentation was used. In this method, at the beginning level, the child looks at a picture and hears the teacher pronounce the word which names it. The teacher then drawls out the sound of the word so that the phonemes can be heard apart more distinctly, and yet remain integrated in the sound structure of the whole word. The teacher pushes one block into each square as each phoneme is pronounced in sequence. In this present study, a blending procedure was added to Elkonin's method. If he used the blending of sounds as the final step, he does not mention it directly. The additional procedure was that,



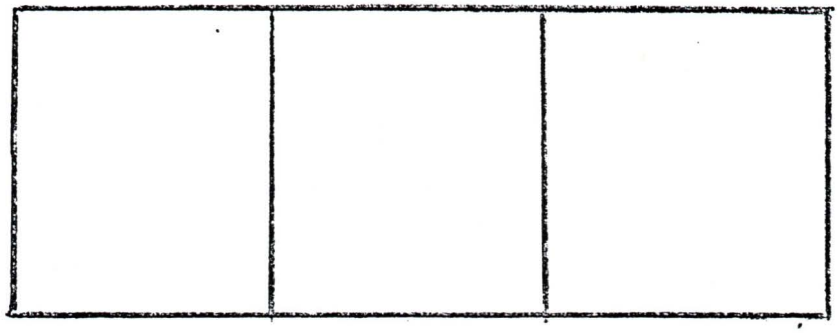


Figure III-1

Example of Picture Card with Diagram of Squares

after the word was drawled out and the blocks were in place, the examiner swept her hand in a left to right motion along the line of blocks gathering together and blending the phonemes back into a whole word. This full teaching procedure was used in the practice session. Each child was allowed several practices, first with the examiner's help and then alone, before proceeding to the test. If the child could not do this segmenting unaided in the practice section, words from Part A were used as further teaching words. No credit was given for these test words if they had been used for the practice. Up to four words were used for re-teaching of phoneme segmentation. If the child was still unable to segment, the testing procedure was stopped.

In the test section, the Parts were arranged in the order of diminishing support from the visual, auditory and tactile aids and in the order of an increasing demand towards a purely mental segmentation skill. In Part A, visual, auditory and tactile aids were all used. In Part B the visual aids were reduced. In Part C the visual aids were removed, leaving the auditory and tactile ones. In Part D the auditory and tactile aids were reduced. In Parts E and F all aids were removed and segmenting skill was expected on the purely mental level.

In Part A, the child was shown a picture and asked to name it. Then, when the picture had been correctly identified, the child was asked to use the blocks to indicate the phonemes of the word just as he/she had done in the preceding practice session. If the child's

pronunciation of the word was inaudible, he/she was asked to speak a little louder. If the child was unable to segment, the word was used as a teaching word and no score was given. Up to four words could be retaught in this way if necessary before the test was continued to the end of the section with no further teaching.

In Part B also, the child was asked to name the picture. If necessary, the examiner helped the child to obtain the correct name of the picture. Then the child was asked to use the blocks to indicate the phonemes just as was done in the previous section, except that in Part B the child was not provided with a diagram of squares.

In Part C, all the aids were put away. A word was said aloud to the child. He/she was asked to pronounce each phoneme of the word, just as before. Individual phonemes were still recorded in this section.

In Part D, the child was requested to do the segmenting silently in his/her head and then tell how many phonemes there were in the word. The examiner pronounced the word and recorded the given number of phonemes calculated by the child. The child was allowed to indicate the number of phonemes by showing fingers and/or saying the number. A time limit was not imposed.

In Part E, the child was again asked to do the segmentation silently in his/her head and then calculate the number of phonemes. This time a time limit of 10 seconds was set for answering.

In Part F, the same directions were given as in Part E but the time limit was reduced to 5 seconds.

For recording the child's responses, all the words were listed on the score sheet. For Parts A, B, and C, each phoneme that the child pronounced was recorded beside the word. If the child combined phonemes, this also was recorded and phonemes omitted were also noted. As a measure of segmentation achievement, one point was awarded for each phoneme clearly segmented. For Part C, the phonemes were recorded in the same manner but, this time, the child received credit only for each word in which the number of phonemes pronounced was complete. In Part D, the number of phonemes calculated and demonstrated with fingers was recorded and each word correctly analysed received credit. In Parts E and F, one credit only was given for each word for which the number of phonemes had been correctly analysed.

First Tryout of the Test

The Phoneme Segmentation Test was administered to 20 primary grade children, the group consisting of 13 kindergarten, 6 grade one and 1 grade two pupil. Time limits precluded the inclusion of more grade two pupils. Teacher judgments of low, average and high language and/or reading ability were used to obtain as wide a range of ability as possible. The grade two pupil was of the upper range in reading. The children came from both morning and afternoon classes.

The results of the first tryout study showed that the range of difficulty of the test items was satisfactory. Three of the low level kindergarten children scored zero on the test and the one grade two

child scored 77 per cent correct. The scores in kindergarten ranged from 0 to 38 per cent. The grade one scores ranged from 34 to 74 per cent. The total range was from 0 to 77 per cent correct. There was no ceiling effect. Table III-1 gives the correct responses by word and by grade.

The other purpose of this first tryout study was to check the suitability of the words for the final form of the test. The number of correct responses for each word was tallied. This showed that the level of difficulty was determined by the number of phonemes that the word contained rather than whether the word was a noun or a verb, or was concrete or abstract. Conjunctions followed the same pattern, the number of phonemes per word seemed to be the most consistent factor in determining the level of difficulty of a word. Part F, nonsense words, produced a similar pattern.

In all parts of the test, when they could hear syllables, some of the children pronounced and/or counted the syllables instead of the phonemes. It was also noted during testing that, if the child was faltering on three and four phoneme words, then the multi-syllable words were often separated into syllables instead of phonemes. Children with superior phoneme segmentation ability were able to segment a word into phonemes no matter whether the word was single or multi-syllable. These observations support the research findings of others that "explicit phoneme segmentation is harder for the young child and develops later than syllable segmentation" (Liberman, Shankweiler, Liberman, Fowler, and Fisher, 1977, p.213 and Leong and

Table III-1

Number of subjects giving correct responses on the First Tryout of the Phoneme Segmentation Test

	K.	Gr.1	Gr.2
	n=13	n=6	n=1
Part A			
bike	5	5	1
boy	6	5	1
mat	5	5	1
cake	4	5	1
bread	0	2	1
door	4	4	1
milk	3	4	1
girls	4	2	1
Part B			
dog	3	6	1
cow	4	6	1
pants	0	1	0
baby	0	0	1
eye	2	4	1
fish	1	6	1
kitty	1	1	1
boot	1	5	1
slippers	0	0	1
runners	0	0	1
Part C			
lunch	1	1	0
thumb	0	3	1
chair	0	3	1
toy	3	6	1
dress	0	3	1
shoes	3	3	1
whistle	0	0	1
scamper	0	0	0
elephant	0	0	0
thermometer	0	0	0

	K.	Gr.1	Gr.2
	n=13	n=6	n=1
Part D			
mud	-	5	1
joy	-	3	0
think	-	0	0
open	-	0	1
love	-	6	1
upon	-	-	-
forget	-	0	0
puddle	-	1	1
reading	-	0	1
table	-	0	1
happiness	-	0	0
raining	-	0	0
Part E			
if	-	3	0
the	-	3	0
and	-	2	1
since	-	1	1
because	-	1	0
so	-	3	1
yet	-	2	1
in	-	5	1
when	-	2	1
once	-	1	1
either	-	3	1
Part F			
ud	-	4	1
wes	-	3	1
tuz	-	3	1
amp	-	2	1
wiget	-	0	0
sisna	-	0	0
ontigoo	-	0	0
zamlen	-	0	0
datiblot	-	0	0

Haines, 1978, p.393). Multi-syllable words seemed to be good indicators of the level of segmenting ability especially on the higher levels of the test.

The decision to include words with /s/ and /nt/ proved useful in showing segmenting ability. Most kindergarten children had difficulty hearing the sound of /n/ in /nt/, whereas many grade one children were able to make this distinction easily. The diphthongs /oy/ and /ow/ caused some difficulty. Some children could hear the change of sound in the phoneme. For scoring purposes, it was decided that, if the child did segment sounds and gave three clear segments for the word "boy," credit would be given for segmenting but the score would be just two points to match the number of phonemes in the word.

Dialect and articulation differences, like lisping, sometimes made it hard for the examiner to decide if phonemes were being separated. When this occurred, the child was asked to repeat his/her response. If the phoneme still could not be determined clearly, no score was given. At the beginning of the testing in this first tryout study, the child was asked to name the picture for the examiner. However, it was found necessary to change this instruction to the subject because sometimes the name the child gave was different from the name expected. For example, "mat" was called "rug" or "carpet" and "kitty" was called "cat" or "kitten." It was decided to name the picture for the child as the starting point. If the child still changed the word, an effort was made to persuade the child to use the

word that the examiner had given. If the child did not change to the word required, the item was not scored.

Some children in kindergarten responded by going directly to meaning. For example, for the word "thumb" they held up their thumbs. Sometimes the response was meaning-related, answering "woof-woof" for the dog picture or just making a comment about it. The lower level of kindergarten children made no effort to segment words into syllables, and they resorted to rhyming in their efforts to give some answer to the examiner's questions.

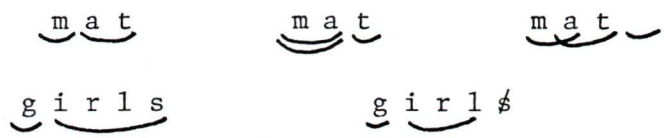
The addition of blending to the testing procedure also proved useful. The blending of sounds back into whole words appeared to give a feeling of completion to the task. For younger children or those who were not segmenting easily yet, the drawling out of the word had to be extended to the extent that short silences came between phonemes. The examiner then modelled a drawl that closed these gaps so that the slow drawl was produced. Then the drawl was shortened, bringing the sounds closer together and, finally, the whole word was said smoothly as in ordinary speech. This demonstration usually received very close attention from the children.

A further small change was introduced to Elkonin's method about mid-way through the testing. After the pictures and blocks had been put away, a transition step was added. Many of the children had been using their fingers to aid in keeping track of the number of phonemes they had segmented when it came to the tests that required a number as an answer. Instead of leaving it to chance that the children would use their fingers, it was made part of the directions and was demonstra-

by the examiner. When kindergarten children lost the help of the diagram of squares, matching blocks to sound became more difficult and errors increased. This supports Elkonin's theory of the progression of difficulty. When they lost both physical aids, the children looked for some support to cope with both sound and number at the same time. Using their fingers was a comforting aid to keep count while the sound was segmented mentally. It seemed to give a clearer picture of the child's segmenting ability when this aid was allowed to be used.

In scoring children's responses as they made them, in this first tryout study, it was found that recording the responses at the side of the words on the scoring sheet was too slow. Therefore, a procedure was adopted of drawing scooping lines under the letters that the children grouped together. This proved far more satisfactory, as it also allowed the repetitions to be shown quickly and accurately. Unsounded letters were crossed out and extra sounds were shown with a short empty scoop.

Example:



Many small precautions about ensuring that the children would leave feeling comfortable about the experience were found to be unnecessary. The children seemed to enjoy the test. No child

refused to participate. Even the ones who had difficulty, appeared to be interested. There seemed to be a sense of accomplishment even from playing with the blocks and sounds in the practice section of the test.

Revision of the Test

The information gathered in the first tryout study was used to revise the Phoneme Segmentation Test for the final edition to be used in the experiment to be reported in Chapter IV. Elkonin's teaching methods and general hierarchy of skill development had proved very effective. Therefore, they were retained with very little modification. Because Elkonin had applied Galperin's theory of skill development, this theory was reviewed with the aim of applying it in the revision of the test. The Fitts and Posner theory was not discarded but it was a more general statement than Galperin's. The name "Part" was changed to "Sub-test" for easier identification between the two forms of the test and the whole test was reduced to five Sub-tests more in keeping with Galperin's five stages. The small adjustments in methodology made in the course of the first tryout study were kept. These were the addition of using fingers as transition aids from "mastering the operation with objects" to "mastering the operation at the level of overt oral speech" (Galperin, as cited by Elkonin, 1973, p.560). The first page of the test was revised so that all the pupil identification data and tabulations of the sub-scores and

total score would appear on one page. The examiner's introductory remarks were added to the beginning of each Sub-test on the score sheet. In the recording procedure, the scooping line to show sound grouping was added to the manual of the instructions for administering the test. The manual was also revised in other ways in accordance with changes in the test.

The weighting of the Sub-tests was changed. Most kindergarten children had not gone beyond Part B of the first tryout test. Part A and Part B had given the most information in assessing kindergarten children. The full range, up to nonsense words, would probably be more applicable to grade one and older children. Therefore, Sub-tests A and B were given more weight.

The first tryout study had indicated that the grammatical category of a word was less important in determining its difficulty in segmentation than the number of phonemes or the number of syllables it contained. This was kept in mind when words were selected from the tested words. Three and four syllable words were omitted, as it had appeared in the first tryout study that these longer words gave little further information than was given by two syllable words. Although words containing /oy/ had caused some problem in scoring, it was decided to keep this phoneme in two words because it is part of many common words and would supply a word with a diphthong in it. One was used in Sub-test A and one in Sub-test C.

An effort was made to have the words in each Sub-test start with shorter words and end with longer, more complex ones. Two new words,

"orange" and "wheels" were added to Sub-test A. This gave a complex five-phoneme word for this Sub-test. It was put into the second to last position because of its probable difficulty in segmenting. The word "wheels" was placed last so that the test would end with a medium length word of moderate difficulty. This was, in case a child was frustrated with segmenting "orange," to provide an easier word to finish the test.

The total score of the test was to be 100 points. The raw score could then be immediately read as a percentage. This limit would also shorten the test and the time for administering it, making it more practical for kindergarten use. Sub-test A with 28 phonemes plus Sub-test B with 27 gave a total of 55 phonemes. This gave segmenting with concrete aids 55 per cent of the test total. The rest of the test was divided into 30 per cent for Sub-test C which contained both segmenting and counting of phonemes. The remaining 15 per cent was divided into 10 per cent for real words and 5 per cent for nonsense words. Both of these last two Sub-tests were assessing mental ability of segmentation. A time limit was imposed only on the nonsense words, Sub-test E. The limit of 10 seconds would insure that too long a time would not be spent on this small area of testing.

The revised Phoneme Segmentation Test consisted of the test materials and administration procedures described below.

Test Materials

Practice Section: The materials were nine plain single-colored wooden blocks (cubes) and one picture card showing an egg cracked out of its shell. On the picture card, below the picture, was a diagram of two squares adjoining one another. These squares were slightly larger than one side of the blocks.

Sub-test A: The materials were nine wooden blocks and eight picture cards with diagrams of adjoining squares drawn under the pictures to match the number of phonemes of the stimulus words. The words were one-syllable nouns, two to five phonemes in length, totalling 28 phonemes. The words, in order, were: "dog," "boy," "cake," "door," "milk," "girls," "orange," "wheels." An example of the picture card "dog" is shown in Figure III-1.

Sub-test B: The materials were nine wooden blocks and seven picture cards, blank under the pictures (i.e. no diagrams of squares). The words were five single-syllable nouns and two two-syllable nouns, three to five phonemes in length, totalling 27 phonemes. The words in order, were: "bike," "fish," "boot," "pants," "bread," "baby," "runners."

Sub-test C: The stimuli were eight words to be pronounced aloud by the examiner. These words were six single-syllable nouns or verbs and two two-syllable verbs, two to six phonemes in length, totalling 30 phonemes. The words, in order, were: "chair," "toy," "thumb," "swing," "dress," "lunch," "whistle," "scamper,"

Sub-test D: The stimuli were ten words to be pronounced aloud by the examiner. These words were one- and two-syllable nouns, verbs and conjunctions, two to five phonemes in length. The words, in order, were: "mud," "love," "puddle," "reading," "table," "in," "the," "when," "since," "because."

Sub-test E: The materials were five nonsense words, two to five phonemes in length. The two longer words had two syllables each. The words, in order, were: "ud," "tiz," "amp," "sesna," "mithler."

Copies of the Phoneme Segmentation Test and the Phoneme Segmentation Test Manual are in the Appendix.

Administrative procedure for the revised test. The test was individually administered in a quiet room with no other people or distractions present. The examiner went to the classroom to get the child or sometimes the first child escorted the next one to the testing room.

In the practice section, the procedure was the same as that used in the first tryout study with the minor modifications noted above. Elkonin's method of teaching phoneme segmentation was followed with the small adjustment noted earlier. Thus, at the beginning level, the child looks at a picture and hears the examiner pronounce the word which names it. The examiner then drawls out the sounds, the phonemes, of the word so that the separate phonemes can be heard more clearly and yet remain integrated in the whole word. As this is done, the examiner pushes one plain block into each square, matching the phoneme structure of the word. Again, in this revised version of the test, a blending process was added to Elkonin's original method. This additional procedure consisted in the examiner sweeping her hand in a left to right motion along the blocks as a gesture to indicate a gathering or blending of the phonemes back into a whole word. This full teaching procedure was used in the practice section. The child was allowed several practices, first with the examiner's help and then alone, before proceeding with the test. If, after four starts, a child could not do this segmenting without assistance with the "egg" card, items from Sub-test A were used as further teaching words. No credit was given for these words if they were so used. Up to four of these words were allowed for reteaching phoneme segmentation. If the child was still unable to segment at all, the testing procedure was stopped. If it was thought necessary to allay anxieties felt by the child, further games with the blocks were played.

Sub-test A: The child was shown the first picture and told its name. The child was asked to repeat the name word. Then the child was given the blocks and asked to use them to indicate the phonemes of the word just as he/she learned to do it before. After the child made his/her response, the blocks were pushed back into a pile and the next card was displayed. While the child was segmenting the phonemes, the examiner recorded the sound groupings with scooping lines under the letters of the word on the score sheet. Repetitions were shown with double scoops. Unsounded letters were crossed out and extra sounds were shown with a short empty scoop. Each picture card was presented in the same way.

Sub-test B: Exactly the same procedure was followed as that described above.

Sub-test C: The child was told that now the blocks and pictures would be put away. As the examiner pronounced the word, she demonstrated counting with fingers touching the table for each phoneme segmented. The practice word, "mouse," was repeated with the child imitating the examiner. Then the examiner pronounced the first test word "chair" and the child was asked to use his/her fingers to show the phonemes in the word. The examiner recorded the phonemes as pronounced by the child. If the finger count and the oral phoneme segmenting did not match, oral segmentation was taken as the better indicator of the child's ability.

Sub-test D: The child was told that this time he/she would have to figure out the phonemes in the words in just the same way except that he/she should do it silently to him/herself and then just tell the examiner how many phonemes the word was comprised of. If the child segmented phonemes aloud or used fingers, this was noted but not stopped. Credit was given only for the number stated by the child. Although there was no time limit on this test, each response took very little time and the next stimulus word was quickly given to keep the testing process moving. The examiner recorded only the number of phonemes that the child said the word contained.

Sub-test E: The child was told that the next words were nonsense words, not real words. He/she was asked to listen to the sounds and then tell how many sounds he/she heard. The time limit per nonsense word was 10 seconds. Then the next stimulus word was given. The examiner recorded the number of phonemes that the child said the word contained.

Second Tryout of the Test (Revised)

The subjects in the second tryout study using the revised Phoneme Segmentation Test were 36 children--18 boys and 18 girls--from an urban elementary school. There were 12 children from kindergarten, 12 from grade one, and 12 from grade two. The teachers were requested to select an equal number of boys and girls at approximately high, medium and low language ability in kindergarten

or reading ability in the other grades. This produced the sample of 18 boys and 18 girls with two to each level in each grade. Of these, 11 pupils from grade one and grade two were receiving Learning Assistance. The children in all grades came from both morning and afternoon classes.

The results showed the range of raw scores for kindergarten was from 4 to 75, a spread of 71; for grade one, from 24 to 78, a spread of 54; and for grade two, from 62 to 85, a spread of 23. The total range was from 4 to 85, a spread of 81. Because the test total was 100, these scores can be read directly as percentages. The spread decreased with the children's age and school grade. There was little difference in the means of the scores between boys and girls. The means were: kindergarten; boys, 39.5, girls, 38.8; grade one, boys, 45.5, girls, 59.6; grade two, boys, 78, girls, 75.1

There was an increasing gain in the scores on the revised Phoneme Segmentation Test from kindergarten to grade two. An analysis of variance conducted on the group means showed a significant grade level difference, $F(2,33) = 13.59$ $p<.01$. Hence the test differentiates levels of ability. Because the Sub-tests did not contain equal numbers of items, the data were converted into percentages of scores that were correct. These percentages are shown in Table III-2 for each Sub-test. The same data are graphed in Figure III-2. There was no significant interaction effect and the trend in each grade was similar. As each Sub-test made more demand toward purely mental segmentation skill, the scores dropped progressively.

Table III-2

Second Tryout Study

Percentage correct in each subsection of the Phoneme Segmentation Test for kindergarten, grade one and grade two.

Subtests	A	B	C	D	E	Grade means $\bar{X}$
Kindergarten	58.0	40.4	32.2	15.0	16.6	32.4
Grade one	59.2	56.5	51.4	35.0	36.6	47.7
Grade two	87.8	76.5	75.0	59.2	58.3	71.37
Subtest $\bar{X}$ means	68.3	57.8	52.8	36.4	37.2	

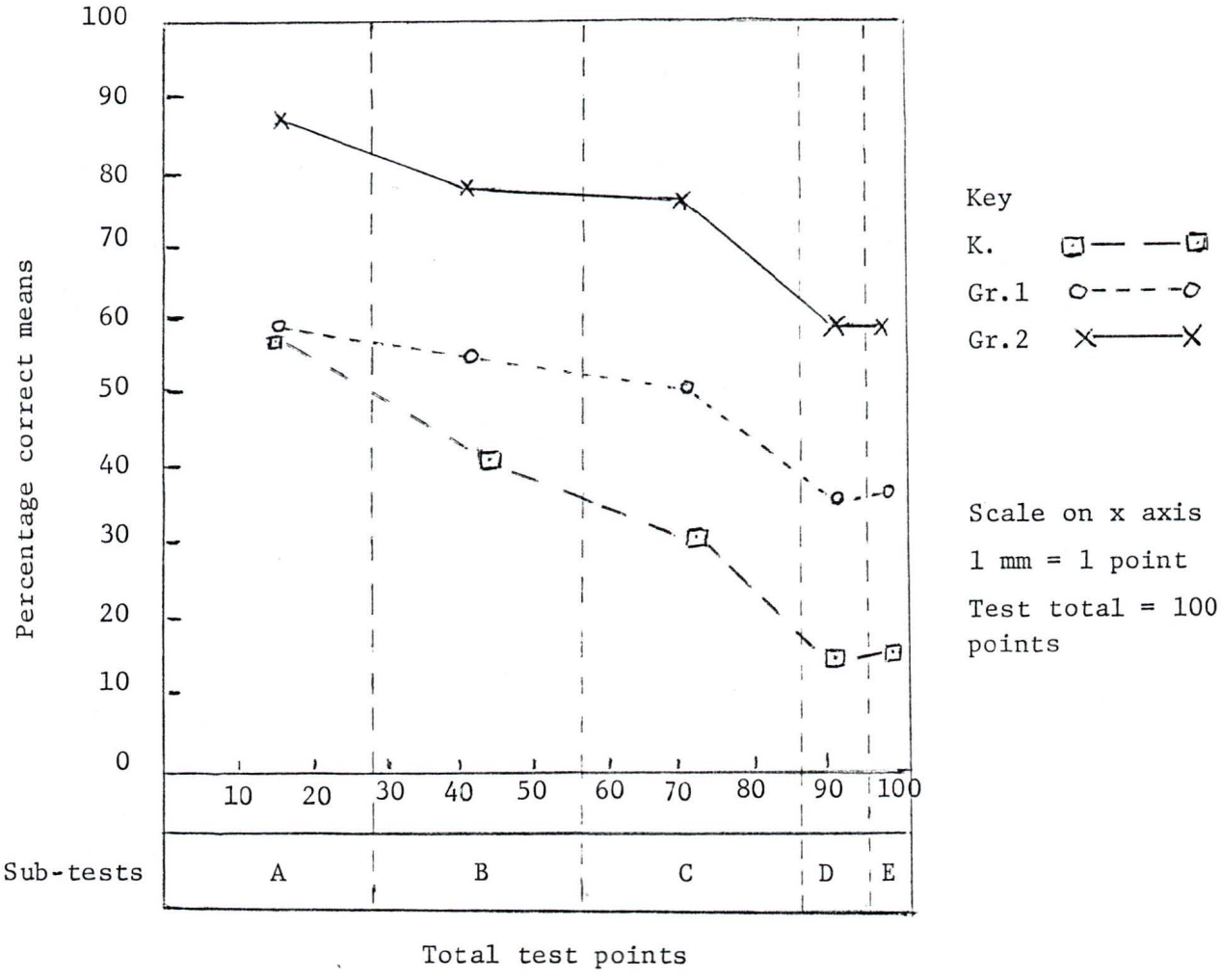


Figure III-2

Percentage correct means by total test score (divided per subtest on scaled space) for kindergarten, grade one and grade two.

Discussion of the Tryout Results

The variance in scores and their downward trend through the Sub-tests followed the same pattern as had been seen in the first tryout study. This shorter test, a partial replication of the first version, had retained its information gathering ability. It distinguished between children at different grade levels and the sub-sections of the test separated between the different levels of difficulty. Sub-tests D and E showed the least difference but, as they were both to be answered at the entirely mental level, it could be said that they were measuring the same factor. Perhaps with older children and those reaching higher competence in the segmentation skill, Part E might still be useful in distinguishing the ability to transfer the sub-skill of segmenting to a more abstract level.

The range of scores was satisfactory, having a spread of 81 points in the 100 point total. This range was similar to that found in the first tryout study which ranged from 0 to 77 with a spread of 77 points. In this second tryout study there was neither a floor nor a ceiling effect.

The wide range of scores and the variance in the sub-tests also supported the choice of words used in the test. Some items might be changed for similar ones to ensure that every phoneme in English was in the test. It seems logical that some of each category of phonemes should be included but it may not be necessary to have every phoneme

represented. A sample of phonemes may be quite sufficient. The phoneme /oy/ continued to give the same problems in the second tryout as it had in the first tryout. The same strategy for scoring was used. If the two-phoneme word was clearly separated into either two or three phonemes, credit was given and scored only two points.

The two new words added to Sub-test A proved useful, both as individual items and as part of lengthening that Sub-test. No new problems with the words developed. Some consideration might be given to having fewer three-phoneme words. When children began to guess, they quite often started to perseverate on "three." This happened mostly on the latter part of the test. But this phenomenon may be an indication of their having reached the limit of their completely mental segmenting ability rather than mere perseveration or misunderstanding of directions. It was also noted that some very young children had difficulty with counting and yet were able to segment phonemes. Others could count well but were unable to match the phonemes to the count. This test may well be tapping the time in growth when these abilities are just developing. A reason for retaining the three-phoneme words as they are in the test is that English has many three-phoneme CVC words in commonplace vocabulary.

The testing techniques and scoring procedures were consolidated. The testing time, which varied with the individual child, was reduced to an average of ten minutes. In scoring, the scooping line was a very effective method of recording the sound groupings given by the child. It was quick to do and easy to interpret in marking later.

Both the variance and the wide range of scores in the test also lend support to the probability that Galperin's theory of skill development and Elkonin's method of phoneme segmentation have been correctly applied to the construction of the Phoneme Segmentation Test.

This association between the successful methodology of this test and a well-established theory also encourages confidence in the test's validity. Thus, it was considered that the Phoneme Segmentation Test was ready to be used as the testing instrument in the experiment on the effects of teaching phoneme segmentation.

In addition to these methodological considerations regarding the tryout results and the theories of Elkonin and Galperin, some new research data were published at the same time as the tryout studies were in progress. Just as the first tryout results were being analysed, Lewkowicz's (1980) article, "Phonemic Awareness Training: What to Teach and How to Teach It," became available. In it, she reviewed the various phonemic training tasks that have been developed and surveyed the current knowledge about how to teach segmentation and blending. Her concept of segmentation is precisely the same as that understood by the author of this thesis in the construction of the Phoneme Segmentation Test. Lewkowicz states that:

> the term segmentation is used only to mean the task of independently discovering and audibly articulating the sounds of a word. Unless otherwise indicated, it means articulating all of the sounds individually (Lewkowicz, 1980, p.688).

She reports that "several recent studies have shown that at least some phonemic awareness tasks can indeed be taught" (Lewkowicz, 1980, p.686), and "some evidence has appeared (Wallach & Wallach, 1976a, Williams, 1980, Rosner, Note 1) showing that such training does in fact contribute to success in beginning reading, confirming that phonemic awareness skills are an important component of readiness for beginning reading, rather than merely being an indication of it" (Lewcowicz, 1980, p.686).

The tasks she lists are: (a) Sound-to-sound matching, (b) Word-to-word matching, (c) Recognition of rhyme, (d) Isolation of a beginning, medial or final sound, (e) Phonemic segmentation, (f) Counting the phonemes, (g) Blending, (h) Deletion of a phoneme, (i) Specifying which phoneme has been deleted, (j) Phoneme substitutions.

She categorized the various phonemic awareness tasks according to their probable usefulness in the early stages of reading-readiness training and proposes the following categories: (a) Tasks that are likely to be useful in the early stages; and (b) Tasks that are likely to be useful (if at all) only in the later stages of training. After discussing each of the ten tasks listed, her conclusion was that: "Blending and segmentation, then, can be regarded as the basic phonemic awareness tasks" (Lewkowicz, 1980, p.691). Her definitions for these terms are: Blending is responding to a sequence of isolated speech sound by recognizing and pronouncing the word that they constitute. Phonemic segmentation is separately

articulating (isolating) all the sounds of a word in correct order.

The Phoneme Segmentation Test is a test of this basic skill of segmenting. Sub-tests A and B test the ability to orally segment words into phonemes at the level of needing concrete aids. Blending, which is called the second basic phonemic awareness task, is part of the practice procedure of the test. Blending is the gathering together of the sounds, opposite from segmenting, but the two processes together develop phonemic awareness.

In listing tasks likely to be more difficult than segmentation, she states that "counting of phonemes should be easier if one has just segmented the word orally" (Lewkowicz, 1980, p.692). In the procedure of Sub-test C, of the Phoneme Segmentation Test, the procedure demonstrated is "counting with fingers touching the table for each phoneme segmented" (this thesis, p.75). This was considered to be the next higher level of difficulty from segmenting with concrete and visual aids. Beyond that it was considered that "counting should be considerably more difficult than segmentation if done without pronouncing the individual sounds at all" (Lewkowicz, 1980, p.692). Sub-test D, the next level of difficulty, required silent mental segmentation and counting because the request was to "just tell the examiner how many phonemes the word was comprised of" (this thesis, p.76).

Under the tasks that might not be helpful, was "sounds that have been deleted" either medial or final. Rosner's Auditory Analysis

Test (1970) uses tasks of omission of sounds. Each task "instructs the child to repeat the word, then to repeat it again but to omit a specified sound" (Rosner, 1970, p.6). The Rosner test was examined by the author of this thesis during the course of constructing the Phoneme Segmentation Test but tasks of omission were considered to be too difficult and tangential and, therefore, similar tasks were excluded from the test. Lewkowicz's survey gives support for this decision.

Thus, overall, Lewkowicz's publication, coming during the course of this author's own research, gave strong support for retaining the test in the form developed for its use in this research project.

CHAPTER IV

THE EXPERIMENT ON THE EFFECTS OF TEACHING PHONEME SEGMENTATION

Aim

The aim of this experiment was to teach phoneme segmentation skills to kindergarten children and measure the effects of this teaching with the Phoneme Segmentation Test that was created and developed in the first part of this research. The hypothesis tested was to be that the subskill of phoneme segmentation in kindergarten children can be improved through training.

Design and Subjects

The design of this experiment involved one experimental group being trained in the skill of phoneme segmentation. This group was to be compared with three control groups that received no phoneme segmentation training.

One of the control groups (Control I) was the same group of urban children that had been a part of the sample in the second tryout study. The other two control groups and the experimental group were recruited especially for this experiment. The design and testing schedule are set out in Table IV-1.

Table IV-1

Design and Testing Schedule

Treatment Group	Month Pre-test	Month Post-test	Month Post-posttest	Month MET Readiness
Experimental	May	June	October	October
Control I	February	October	-	October
Control II	May	June	October	October
Control III	May	June	October	October

The number of subjects of each sex in each group is shown in Table IV-2.

Table IV-2

Number of Subjects of Each Sex in Treatment Group

Group	Female	Male	Group Total
Experimental	6	9	15
Control I	6	6	12
Control II	8	8	15
Control III	6	4	10
Total	26	27	52

The experimental group and control group II began as two separate kindergarten classes taught by the same teacher in one school in a suburban area. Control group I began as a kindergarten class in an urban area. (These were the children who were subjects in the second tryout study). Control group III began as a kindergarten class in a rural area.

Practical circumstances in the schools that were beyond the control of the experimenter caused the somewhat uneven timing of the testing. Thus, while control group I had an interval between pre- and post-testing of about eight months, the other three treatment groups were administered the pre-test, post-test, and post-posttest all in the period of about six months. All of the subjects were in grade one at the time of the final post-posttest and all received it in October after about one month of grade one.

The test administered at the pre-testing and both post-testing stages was the Phoneme Segmentation Test that has been described in Chapter III.

Level II, Form Q, of the Metropolitan Readiness Tests, (revised by Nurss and McGauvran, 1976), was administered during the same period as the final post-testing with the Phoneme Segmentation Test. The Metropolitan Readiness Tests were administered at the schools by the teachers. They were included to provide a comparison between the results of the Phoneme Segmentation Test and a well-established measure of reading readiness.

The Metropolitan Readiness Tests (MET) consist of four "skill" areas to be measured: "Auditory," "Visual," "Language," and "Quantitative." The Auditory area is divided into "Beginning Consonants" and "Sound-letter Correspondence." The scores from these two sub-tests are combined to give the Stanine rating for the Auditory area. For the Sound-letter Correspondence the children need to know the letters of the alphabet to match them to sound, thus, only half of the Stanine value is a measure for discriminating between sounds.

The Teacher's Manual Part II: Interpretation and Use of Test Results states that "The auditory items for Level II were screened so that the items allocated to one of the two alternate forms (Form P) would contain only those sounds which are equally familiar to pupils who speak Spanish and to those who speak standard American English or a non-standard dialect" (Nurss and McGauvran, 1976, p.21).

The choice of the MET for this experiment came out of necessity. The urban school used in this study always administers this test and was not willing to give another one. The suburban schools agreed to administer the MET, as none of them was planning to give any particular standardized readiness test. The MET Auditory Stanine was used for comparison with the data from the Phoneme Segmentation Test, as it is the MET sub-test closest to the skill being measured by the instrument created especially for this experiment. However, it is important to note that the MET Auditory sub-test is a gross measure involving more than just phoneme segmentation ability. It requires

the children to know the letters of the alphabet and to match them to sound.

Treatment of the Experimental Group

A series of lessons was planned to teach the phoneme segmentation sub-skill to the subjects in the experimental group. The lessons were based on the theories of Elkonin and Galperin described earlier. Since the Phoneme Segmentation Test was also based on those theories, there is some similarity between the content of the lessons and the test. However, the lessons were quite different from those employed in the test. Each child was given six lessons of about 20 minutes each. The first and second lessons were given individually. The next three lessons were given first in small and then in medium-sized groups. The final lesson was a whole class group lesson. All the teaching was done in the corner of the kindergarten room while the regular classroom activities were proceeding. Little change was made in the regular class routine. No pupil was removed for phoneme segmentation teaching during arithmetic instruction, the Math Their Way program, or when some interesting group activity was happening. In this way, most of the phoneme segmentation sub-skill training took place during the pupil's period of free choice of activity. The classroom teacher made arrangements so that the movement into the phoneme teaching corner flowed easily. A daily individual log was

kept of the materials each child had used, the child's progress, and other pertinent information.

Teaching Materials. The materials employed in the phoneme segmentation lessons consisted of (a) wooden cubes, (b) picture blocks, (c) picture cards, and (d) cards showing diagrams of adjoining squares.

(a) The wooden blocks were one inch cubes, about 200 in various colors. There was sufficient quantity to have at least 10 blocks of any one color available. These are standard kindergarten equipment.

(b) The picture blocks were from a commercial kindergarten kit, Synthesis in 3, 245-1, made in Belgium. These picture blocks are 4 cm. x 4 cm. x 0.5 cm., with simplified drawings of common everday objects on one side and blank on the other side. From this set of blocks, the pictures selected for the experimental group's lessons were those showing the following objects: bed, sun, nest, wrench, flowers, toothpaste, soup spoon, gas bottle. This kit was part of the kindergarten's regular materials.

(c) The picture cards were 8" x 11" colored sheets of paper with pictures pasted on them. The pictures illustrated the following objects: cat, man, tire, car. Other pictures of individual objects and group situations were available, if needed.

(d) The diagram cards were separate 3" x 8" cards which had two, three, or four adjoining squares drawn on them.

Procedure

LESSON 1

For the first lesson, the four picture cards, squares diagram cards and single-colored cubes were used. For the first card, the picture was named by the experimenter and the child repeated the word. The card with three adjoining squares was slid under the picture and then the experimenter "drawled out" (Elkonin, 1973, p.563) the phonemes of the word, pushing a block into a square to match each phoneme. Together, the experimenter and the child practised this drawling of the sounds of a word and matching its phonemes with the blocks. Then the child was asked if he/she could do it by him/herself. If he/she could do it independently with clear segmentation of the phonemes and clear matching of the phoneme to the block as it was put into the square, it was considered correct. Then the next picture card was introduced and the same procedure was used as with the first one. All four picture cards were taught this way before the second lesson was begun. When the child was able to do all four picture cards independently, the experimenter proceeded to the next lesson and continued teaching until the allotted 20 minutes of time was up. If the child could not segment the word for the first or succeeding cards successfully, the experimenter modelled the procedure again and helped the child until he/she was able to solve the problem. After 20 minutes the lesson was stopped and the session ended. In the next teaching session, the experimenter began

with a brief review to the point the child had reached in the previous session, and then continued the lesson from there. This supportive procedure of teaching was continued in each learning session until the child was successful. If the child was unable to segment independently and appeared to be becoming anxious, other games were played with the blocks for a little while. Then, if practical, the lesson was begun again. The teaching in the individual and small group sessions was all done with the experimenter seated beside the subject, so that both were looking at the materials from the same side.

LESSON 2

The child was given the picture card but the diagram card was not placed beneath it. The diagram cards were kept nearby if the need arose to use them again. The child was required to demonstrate phoneme segmentation with the blocks alone. If he/she did all four cards independently and successfully, then the experimenter showed the child some of the picture blocks and asked him/her to name the pictured object. Whatever name the child gave to it was the word used for the segmentation task. For example, if the child named the picture of the toque as "hat," "hat" was the word to be segmented. No effort was made to change the child's choice of word. If three and four phoneme words were segmented independently and correctly, then the picture blocks for longer and compound words were displayed.

If the child could segment these, the rest of the session was spent on a variety of words, some given orally without pictures. If the child had any difficulty, the time was spent helping the child to make progress from the point he/she had reached in developing this sub-skill. The record in the child's individual log provided the starting point for the next session.

LESSON 3

The experimenter began by reviewing the method of segmenting a word with blocks, using picture blocks and orally given words. If this was done correctly, the next step was to introduce the use of fingers as concrete representations of phonemes. The first words used were short and then the experimenter moved on to longer words and to compound words. When independence was reached, a small group was formed and the same thing was done in a group. It was considered that when the child reached this level of independence in this skill, he/she would be able to work with other children and still attend to the given task. It also gave the child an opportunity to follow a peer model rather than an adult one.

LESSON 4

This lesson differed according to the level attained by each subject. For the subjects who had attained independence with segmenting and using their fingers as symbols for phonemes, the next step was to locate the phoneme's position in a word. First a word was segmented and the blocks were again used to represent the phonemes.

Then a game was introduced. In a group, each child had his/her own set of blocks. This grouping began with just two children in each group for the first time. Then the experimenter pronounced the sound of one of the phonemes and the children had to point to the block in the correct position of the spatial sequence of blocks that represented the temporal sequence of the phonemes in the spoken word. Beginning, final and medial sounds were introduced in that order. This game was called "Find the Sound." When the children became proficient in this task, the object of the game was reversed. The experimenter touched a block and the child had to say the phoneme. This game was called "Which One?". When this task was clearly comprehended, the experimenter withdrew from the game to become an observer, helping only when it was essential. The two children played the game by themselves in both of the ways described above.

LESSON 5

This lesson required the child to state the number of separate sounds heard in a word. Fingers were used to keep track of the number of sounds (phonemes) that were heard. Two types of responses were recorded:

(1) the number indicated on the fingers

and (2) the number stated verbally.

This game was called "How Many?". In this lesson the games of the

previous lessons were reviewed in groups. All children were included in the review, which included the finger counting of segmented phonemes. For children who had not reached this level, it became a demonstration lesson with peers as models. This was a preparatory lesson for the large group work in lesson 6.

LESSON 6

This was a total group lesson with all the children in the experimental group seated in a circle. Words were given orally and everyone, including the experimenter, drawled out the word and kept count of the phonemes with their fingers. The experimenter chose the words at the beginning and the children were allowed to volunteer words later in the lesson. In this lesson there are two added difficulties for the child. Firstly, there is the problem of hearing the words at a greater distance and from different voices. Secondly, in a circle formation there is the problem of seeing the finger segmenting being done as in a mirror image across the circle. This visual image needs translation in one's mind when checking the correctness of one's own answer. This circle formation was used in order to try the teaching method in the circle formation that is often used by kindergarten teachers.

There was a two week interval before the post-test on phoneme segmentation was administered.

Results

The results of all the tests are shown in Tables IV-3, IV-4, IV-5 and IV-6, each of these tables providing the complete results for each group in the experiment.

Table IV-3

Experimental Group Testing Results

No.	Sex	Pre-test May,1981	Post-test June,1981,	Post-post Oct.,1981	Gain May - June	Gain May - Oct.	Gain June-Oct.	Auditory MET Stanine Oct.
1	f	63	71	66	+8	+3	-5	6
2	m	4	39	28	+35	+24	-11	5
3	m	41	62	61	+21	+20	-1	7
4	f	33	68	55	+35	+22	-13	8
5	m	45	56	67	+11	+22	+11	5
6	f	68	85	90	+17	+22	+5	6
7	m	48	73	58	+25	+10	-15	8
8	f	60	57	66	-3	+6	+9	8
9	m	23	32	27	+9	+4	-5	3
10	f	64	88	63	+24	-1	-25	8
11	m	25	38	64	+13	+39	+26	9
12	f	58	74	66	+16	+8	-8	8
13	m	28	49	48	+21	+20	-1	5
14	m	2	3	13	+1	+11	+10	3
15	m	45	57	42	+12	-3	-15	7
TOTAL		607	852	814	245	207	-38	96
$\bar{x}$		40.46	56.80	54.26	16.33	13.8	-2.5	6.4

Table IV-4

Control Group I Testing Results

No.	Sex	Pre-test Feb., 1981	Post-test Oct., 1981	Gain Feb.-Oct.	Auditory MET Stanine Oct.
1	m	63	42	-21	8
2	f	8	27	+19	5
3	f	4	26	+22	5
4	f	41	51	+10	9
5	f	61	32	-29	7
6	m	46	57	+11	6
7	f	70	68	-2	9
8	m	28	absent	-	-
9	m	12	absent	-	-
10	f	49	moved	-	-
11	m	13	moved	-	-
12	m	75	moved	-	-
TOTAL		470	303	+10	49
$\bar{X}$		39.16	43.28	+1.42	7

Table IV-5

Control Group II Testing Results

No.	Sex	Pre-test May,1981	Post-test June,1981	Post-post Oct.,1981	Gain May - June	Gain May - Oct.	Gain June-Oct.	Auditory MET Stanine Oct.
1	f	46	29	48	-17	+2	+19	7
2	m	5	12	12	+7	+7	0	4
3	f	22	43	63	+21	+41	+20	5
4	m	2	11	18	+9	+16	+7	8
5	f	51	50	50	-1	-1	0	7
6	f	14	16	62	+2	+48	+46	4
7	f	3	13	11	+10	+8	-2	5
8	f	11	28	46	+17	+35	+18	8
9	m	0	5	1	+5	+1	-4	4
10	m	3	2	13	-1	+10	+11	5
11	f	5	22	22	+17	+17	0	6
12	m	66	71	61	+5	-5	-10	7
13	f	42	32	53	-10	+11	+21	8
14	m	67	67	absent	0	-	-	-
15	m	6	-	-	-	-	-	-
16	m	41	34	moved	-7	-	-	-
TOTAL		378	435	460	57	190	126	78
$\overline{X}$		25.2	29.0	35.38	3.80	14.61	9.69	6.0

Table IV-6

Control Group III Testing Results

No.	Sex	Pre-test May,1981	Post-test June,1981	Post-post Oct.,1981	Gain May - June	Gain May - Oct.	Gain June-Oct.	Auditory MET Stanine Oct.
1	m	2	moved	-	-	-	-	-
2	m	4	15	31	+11	+27	+16	5
3	f	49	24	55	-25	+6	+31	7
4	m	69	54	48	-15	-21	-6	7
5	f	1	0	13	-1	+12	+13	4
6	f	1	9	46	+8	+45	+37	6
7	f	10	8	39	-2	+29	+31	4
8	f	9	9	24	0	+15	+15	5
9	m	0	5	30	+5	+30	+25	5
10	f	0	17	13	+17	+13	-4	4
TOTAL		143	141	299	-2	156	158	47
$\bar{X}$		15.88	15.66	33.22	-0.22	17.33	17.55	5.22

The means from the individual treatment groups are summarized and compared in Table IV-7. The pre-test data from control groups II and III unfortunately resulted in much lower baselines of

Table IV-7

Comparison of Means of the
Experimental and Control Groups

Group	Pre-test	Post-test 1	Post-test 2	MET	Gain Post-Pre	Gain Post-post -Pre
Experimental	40.46	56.80	54.26	6.40	16.33	13.80
Control I	39.16	43.28	-	7.00	1.42	-
Control II	25.20	29.00	35.38	6.00	3.80	14.61
Control III	15.88	15.66	33.22	5.22	-0.22	17.33

performance of their subjects than the baseline of the subjects in the experimental group. It was for this reason that control group I was added to the final experiment. (It is named I for convenience in making comparisons in Table IV-7). The experimental group and control group I had approximately the same baseline level of performance. Thus the hypothesis to be tested in this experiment can best be approached by comparing the results from the experimental group and control group I.

The approach to the statistical analysis of the data was based on the work of Huck and McLean. In their discussion of the Pretest-Posttest control group design, they state that "the results provided by the repeated measures ANOVA can be misleading" (1975, p.511). Lack of awareness of this fact has led to statistical procedures that have given "(a) incorrect statements regarding treatment effects, (b) completely redundant reanalyses of the same data, and (c) problems with respect to post hoc investigations" (1975, p.511). They suggest that:

> the analysis of gain scores--as an alternative to the repeated measures ANOVA--yields the same amount of useful information in a far more straightforward, parsimonious manner (1975, p.517).

Gain scores were used for the single classification analysis of variance for Pre- versus Post-test 1 and a significant difference was found among the four groups, F (3,42) = 3.97 $p<.05$. In the comparison of the experimental group with the comparable control group (i.e. group I, which had approximately the same baseline level of performance) it was found that there was a significant improvement, F (1,20) = 20.25 $p<.01$, in the experimental group after a one month period and this higher level of performance was maintained on a delayed posttest four months later, with negligible regression to baseline. Control group I showed nonsignificant change on the posttest nine months later. The other two control groups (II and III) with a low baseline, showed small and nonsignificant changes on the Post-test 1 (3.8 gain, -0.22 loss). However, with the additional

passage of time, in the Post-test 2, both these groups reached a level of performance near the baseline of the two high baseline groups (experimental group and control group I).

Discussion

The hypothesis that the subskill of phoneme segmentation in kindergarten children can be improved through training was supported by this experiment. The experimental group that received phoneme segmentation training showed significant improvement in phoneme segmentation and this improvement was maintained at retesting four months later. In contrast, control group I, which started from a comparable baseline and received no phoneme segmentation training, showed no significant change even after a delay of nine months--ample time for any spontaneous improvement. Thus, the comparison of these two groups with the comparable baselines indicates that phoneme segmentation training is effective in improving that subskill in kindergarten children and that the effect is relatively long term.

The data from control groups II and II are inconclusive. As there are no data from an experimental group of children with comparably low baselines who did receive training, it cannot be assumed that they would have improved with training. It might be that a child must reach some minimal level of performance before training can be effective. However, individual scores show that many of the major improvements in scores were at the lower levels of achievement.

With the additional passage of time at the Post-test 2, there was an untrained improvement in the low baseline control groups II and III, to the point where they both reached a level of performance near the initial baseline levels of the high baseline groups. Children with very low baseline scores seemed to improve spontaneously in segmentation skills over time. However, there was an important difference between the experimental and control groups in the rate at which this improvement occurred. The experimental group children improved immediately after training, whereas the control groups with low baselines only showed improvement after a much longer time period (4 months). Another important difference is that the final level reached by control groups II and III was similar to the initial baseline of the experimental group, not the final higher level reached by this group after training.

As shown in Figure IV-1, if the trained group is compared with control group II which had the same teacher, there is a 15.26 per cent difference between these groups on the pretest and an 18.88 per cent difference on the post-posttest four months later. This might suggest that the net effect of training was only about 3.6 per cent. The large difference between these two groups (27.80 per cent), which was observed on the first posttest, "washed out" or decreased over the four month interval due to two reasons. First there was a small regression in performance on the part of the trained children and secondly there was spontaneous improvement in the controls.

However, the absolute level of performance remained higher in the trained group.

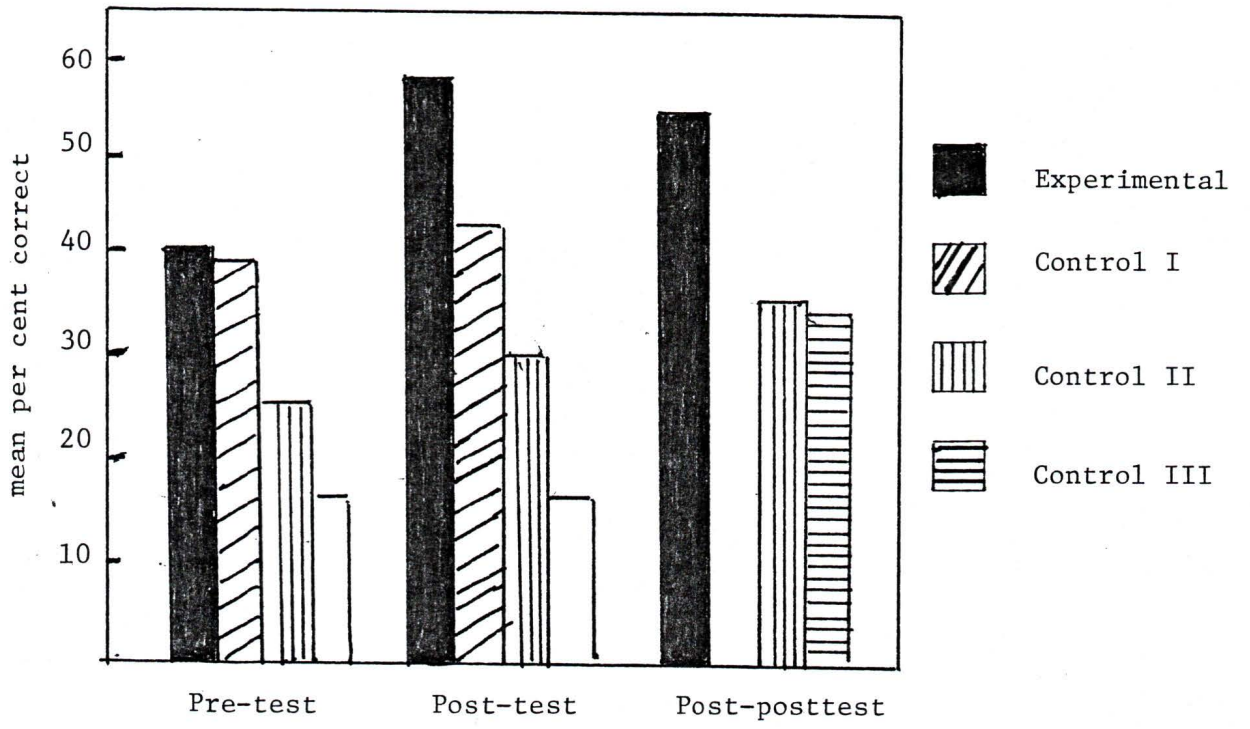


Figure IV-1
Mean per cent correct for the experimental and control groups I, II, III, for the pre, post, and post-post test sessions.

The testing time was spread over a nine month period. Figure IV-2 reflects the time course of all events for all groups. The marked improvement of the trained group is evident in this figure and the "weak training" effect considered possible, is also discernable.

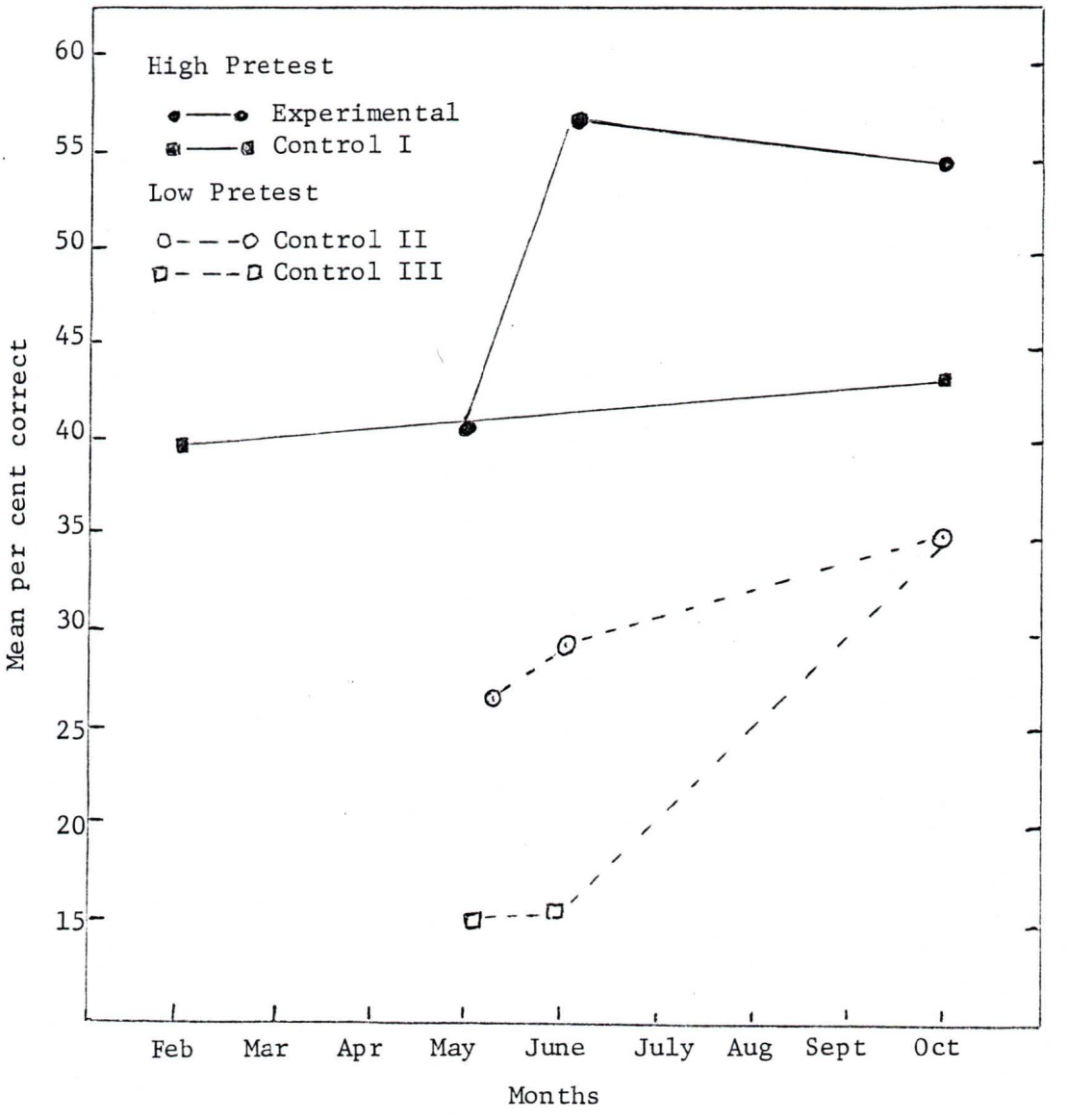


Figure IV-2

Mean per cent correct on the Phoneme Segmentation Test by months for the experimental group and control groups I, II and III.

In the discussion of the results above, the term "spontaneous" has been used to describe the improvements found in the control group's test results because there is no evidence as to why these changes occurred. One could speculate about experiences and maturation which could contribute to such changes. It could be that these children would have improved if they had never seen a segmentation test. Alternatively, it might be that exposure to the segmentation test twice within a period of six weeks acted as a weak form of training or at least sensitized the children to the notion of segmentation. Testing as a form of "weak training" may require greater incubation time before its effect is reflected in criterion performance.

During the testing procedure, the experimenter observed that literacy appeared to be an interfering factor for some children, especially those who were scoring well at the beginning of the test. A child would give the names of the letters of the word, saying "I can spell that," or would give a mixture of sounds and names, for example, saying "buh-ai-bee" for "baby" and "duh-er-ess" for "dress." Also, there was some oral counting and naming of letters with words like "fish" or "boot" and then a switch to checking the number of sounds before pushing the blocks to show the number of phonemes. Most of these high-scoring children did set out the correct number of blocks for phonemes in the first three sub-tests. Later in the test, the counting began to work in the opposite direction,

for, in Sub-tests D and E, the knowledge of letters sometimes prevailed over the hearing and counting of phonemes and, for words like "love," "the," and "when," the number of letters was given instead (e.g. 4 instead of 3 for "love"). The Phoneme Segmentation Test was sensitive to these changes and the score dropped accordingly when a child confused letter names with sounds.

Another problem found in this study is one that is generally present when working with very young children in a field study such as this. The researcher has no control over the day-to-day events in the classroom and their effect on the child. Occasionally these events affect test results noticeably. Accurate testing of young children in school has its difficulties at any time.

The MET test results proved disappointing as a comparison measure. There was a rough match between the MET results and those of the Phoneme Segmentation Test in only one respect. Low scorers were usually low on both tests. Variation in teacher administration of the MET also appeared possible. One class scored very high on MET, although this group was supposedly similar in ability to the other adjacent class which had notably lower MET scores.*

The other difficulty found with the MET tests was in the test items themselves. In the "Beginning Consonants" test, the only purely auditory section, the first two items were two-phoneme blends /tr/ and /fr/. The final item was /st/, to be distinguished from other consonants between which distinctions had to be made mostly in initial

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* Post-test 2 and M.E.T. scores correlate positively, $r = .567$, $p < .01$.

position in a word but some items also had that same sound in medial and final positions. In the "Sound-letter Correspondence" test which requires the child to know the letters of the alphabet, four of the sixteen items called for a distinction involving two phonemes as a group. Four double consonants /dr/, /sp/, /gl/, and /st/ are expected to be recognized as separate sounds. Since only a part of the Auditory Stanine of the MET is based on auditory discrimination only, it was a poor basis for comparison. Although the MET and the Phoneme Segmentation Test are related to reading readiness, the theoretical bases are so different that it is difficult to make an effective comparison between them. This difference concerning the components of conventional reading readiness tests initiated the construction of the Phoneme Segmentation Test in the first place. Thus little was learned from the application of the MET in this study. One interesting speculation regarding the agreement of the two tests on the low scoring subjects is that possibly the Phoneme Segmentation Test result is an explanation of the result of the MET which, by itself, cannot be explained because more than one subskill is being tested simultaneously.

The experimenter's informal observations and subjective judgments during the phoneme segmentation training sessions may provide some further slight evidence on the effectiveness of the teaching methodology. In the experimental teaching project it was possible for the experi-

menter to work in the corner of the kindergarten room with simple materials to teach phonematic listening skills to the children. The little blocks with pictures on them proved to be effective and also helped the experimenter to keep track of the words used. The single color for the blocks was important in the beginning stage. When the children had to use multi-colored blocks later in groups, they were distracted into naming and counting the colors, matching or dividing by color, instead of attending to the concept of sound which was being taught. This supports Elkonin's contention that the "use of plain counters prevented any confusion of purpose" (Elkonin, 1973, p.563).

The little games were popular with the children. "Find the Sound" and "Which One?" required a fair amount of thought and effort but they also created much interest. Although the children occasionally played these games on their own, apart from the study, the effectiveness of teaching the phoneme segmentation subskill depends on the teacher being present and directly involved, in order to prevent erroneous patterns being practised and accepted as correct. Most of the program used by the experimenter probably could be taught by a kindergarten teacher in the course of a regular daily routine. Some extra consideration would have to be given to the beginning individual lessons. A kindergarten teacher working alone in the classroom might find it difficult to give undivided attention to the child in the beginning

stage lessons. Articulation, understanding, and level of ability are all being assessed and extended during this teaching time. Further research is required in order to develop feasible methods for implementing this instruction in kindergarten.

Another source of evidence on the effects of training phoneme segmentation occurred accidentally during the same time that this experiment was being conducted. Another teacher at a different school tried to train her kindergarten children in phoneme segmentation in an informal study. This group was not included in the main research study because the teacher taught the oral segmentation subskill in the last few months of school. She had begun with letter names and sounds in January, teaching "This letter's name is "ai" and when "ai" talks * it says /ă/." Later in the spring the whole group together practised oral segmenting of three letter words, drawling out the sounds and then blending them together again. Some children then made little booklets, pasting one word to a page and illustrating the word. They read their "books" to the principal and the grade one teacher. These children were tested on the Phoneme Segmentation Test with the results shown in Table IV-8.

Table IV-8

Informal Study of Phoneme Segmentation Training

Pretest	Posttest	Postpost	Gain Post-Pre	Gain Postpost-Pre
29.85	45.30	43.00	+15.46	-1.72

n =11

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* "ai" refers to the name of the letter a. Using IPA values this would be ei.

The pretest mean for this group was below the means for the "high baseline" groups (40.46, 39.16) but higher than the other "low baseline" control groups of the formal experiment (25.20, 15.88). This informal group had a gain of 15.46 per cent in June and a slight loss of -1.72 per cent in October, but they maintained a higher level of absolute score (43.0) than the "low baseline" controls (33.22, 35.38) in the postpost tests. Their general progress was similar to that of the experimental group. The teacher stated that the inclusion of this form of phoneme segmentation training was a useful addition to her program and she planned to use it again next year. Both the kindergarten and grade one teachers planned to study the effects on the reading progress of these children the following year.

The kindergarten teacher had also noted on the report card of one child who was having difficulty that "He has the names of the letters so firmly established that he is reluctant to accept that they also make sounds." This observation is in accord with those made by Samuels (1971) and Elkonin (1973) that were reviewed earlier in Chapter II.

The author of this thesis ran into a number of difficulties in this investigation. Some have been mentioned already, but a brief summary may underline the limitations of this study. Attrition in the number of subjects resulted in rather small samples. Another problem arose from the accidental difference in baselines between groups. This was particularly unfortunate in the case of the two

groups with the same teacher. But it was unavoidable in the circumstances of this field experiment. If better research facilities in a wider range of schools were available, a superior design for any future study would be to select subjects by different initial levels of phoneme segmentation ability. This might give information on the amount of change produced at various baseline levels.

The statistical and subjective observations of this study show that the phoneme segmentation subskill can be taught, but it was not within its scope to relate improvement in this subskill to degree of success in reading. This would require a longitudinal study that followed the subjects to the grade two level at least. If this were done, the individual profiles of the subjects could be enlightening also. Again, much larger sample sizes would be needed to cope with the attrition problem found here.

The methods of instruction which relate phoneme segmentation subskill to the skill of beginning reading would also need further consideration. At this level it is useful to consider Downing's comment that:

> what is important in the very beginning of learning to read is not the memorizing of speech-to-print relations such as sounds and letters, but a clear understanding of the featural concepts that are a prerequisite for reasoning about these relationships (1979, p.20).

The methods of handling the teaching of this relationship have not been covered by this study. There is research data available for consideration. Elkonin has described the methods used for the Russian language. They could be adapted for use with English. When considering teaching methods, the difference between the teaching of "phonics" and phonematic hearing would need to be clearly established. Use of the Phoneme Segmentation Test would focus attention on the concept of the phoneme and bring this feature of language to the level of awareness. Knowledge regarding the phoneme might also show teachers more clearly what part of their teaching of "sounds" was related to phonemes and it might make it easier to explain and correct the letter-name misunderstanding that many children develop. Appropriate teaching materials may not be easily available. Current beginning to read materials, including those approved at present by the British Columbia Ministry of Education, need to be evaluated for their adaptability to such a different approach.

Learning Assistance is another area in which the use of the Phoneme Segmentation Test could be of value. It could become a testing instrument for assessing those children who were having problems in reading. Norms would need to be established for regular class students in the three primary grades.

In discussing linguistic awareness, Mattingly comments that:

> The written text initiates the synthetic linguistic process common to both reading and speech, enabling the reader to get the writer's message and so to recognize what has been written (1976, p.37).

Perhaps one important consideration here is that the message must be written first. From speech to written message--why not teach writing first? Imitate the order of the "creators of that code or writing system" (Downing, 1979, p.37). Write first, then read. The children would probably follow this order just as readily as the one imposed on them now. It might even be easier. Most children write messages in their squiggles after they become aware of adults doing writing. Children try to record their ideas first in pictures and then later in their own invented spellings. This kind of change in the order of teaching reading is close to the Language Experience approach. Support for this also comes from Fausek who comments that:

> Experience taught me to discriminate clearly between writing and reading, and convinced me that these two acts are not at all parallel. Contrary to the generally accepted view, writing precedes reading (Fausek, p.76, as cited by Nazarova, 1982, p.39).

The step from speech to writing might be made easier if we taught phoneme segmentation in kindergarten, or in grade one if it was needed, so that the children would become aware of the structure of their speech before they started to match it to the conventional squiggles of print that we call letters. This prior knowledge of phonemes might be of great value to them. Then the discovery of the phoneme might be the "magnificent achievement of linguistic science" that Kramsky claimed it to be.

Summary

The Phoneme Segmentation Test was an effective instrument for measuring phoneme segmentation ability in kindergarten children. The order of giving and then withdrawing tactile, visual and auditory aids in the sub-tests appeared to be in the correct sequence to show the level of achievement in phoneme segmenting skill. Although there was some indication of practice effect, it did not interfere with the capacity of the test to show the level of the child's attainment in this skill. A replication of the test with larger sample sizes would be needed because the test appears to have the potential for use as a kindergarten and grade one assessment test. There is a possibility that its use could be extended to the Learning Assistance area.

The experiment showed that kindergarten children could be taught phoneme segmenting skill. It was possible to do so in a regular kindergarten room with simple inexpensive materials. Elkonin's methodology of teaching phonematic hearing with the aid of wooden blocks and squares proved effective. Most children responded to the teaching, some progressing faster than others. The improved ability to segment phonemes was maintained over several months. Theory indicates that segmenting is a sub skill of reading and possibly even a prerequisite to learning to read. Consideration needs to be given to making phoneme segmenting a part of kindergarten instruction and for examining its place in the grade one reading program.

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APPENDIX

1. Phoneme Segmentation Test

2. Administration Manual for the Phoneme Segmentation Test

3. Table A

PHONEME SEGMENTATION TEST

EXAMINER'S MANUAL

Aula L. Bell

Administration Procedures and Scoring

January, 1981, revised February, 1981

PHONEME SEGMENTATION TEST

Introduction

This test assesses a child's ability to segment the words of oral speech into phonemes. For the rationale see the thesis "Phoneme Segmentation and the Acquisition of Reading" by Aula L. Bell. The range is from no segmentation ability to silent mental fluency.

General Directions for Administration

A quiet room with no traffic going through is needed. Two chairs are needed in front of a small table. The materials of the test kit are listed under specific directions. It is best to get the child from the classroom and walk together to the testing room. If practical, the first child can then bring the next one to the room. The pupil's name, grade and age may be recorded ahead of time on the test booklet but the information needs to be rechecked in conversation with the child before beginning testing. The testing time will vary from 10 to 15 minutes. Each child is tested individually. Verbal directions to the child are given at the beginning of each sub-test and are printed on the test booklet.

Specific Directions for Administering and Scoring

DEMONSTRATION

Materials: one picture card of an egg cracked out of its shell with two adjoining squares drawn underneath the pictures; 9 plain single-colored blocks (one inch wooden cubes).

Directions: Take out Egg card and blocks. Talk and demonstrate at the same time.

1. "I have some things to show you. I will do it first; then you do it with me. You watch first. Here is a picture of an egg. The sounds are /e/---/g/ (drawl), (Repeat, pushing block into squares) /e/, slight pause, (push block) /g/ (Demonstrate again, using blocks, show separation, drawl, and blend), /e/, /g/, /e/---/g/, /eg/blend."

   (Demonstrate blend with small hand movement in L to R sequence of gathering.) Whole demonstration may be repeated if child seems inattentive or confused.

2. "Let's do it together. You push the blocks, I will say the sounds. You say the sounds too."

3. "You do it all. I will help, if you want me to." (If the child falters badly, offer to do it together again.)

4. "Are you ready to do it by yourself?"

"NO"

Go back to Part 2. Repeat whole sequence, help as needed. Ask again if ready. Record number of demonstrations given. If four unsuccessful trials are recorded do not go on with the test. Play and demonstrate for another time and return to classroom.

"YES"

"That's fine. You do it by yourself."

Begin Test A.

SUBTEST A

Materials: 8 picture cards with adjoining squares drawn underneath the pictures; dog, boy, cake, door, milk, girls, orange, wheels. 9 single-colored wooden one-inch cubes.

Directions: If child is unable to segment the first item /dog/, demonstrate with sounds and blocks but give no score. If help is needed on the next three cards also, record answers but give no score if helped. If no score reached by item 4, /door/, stop testing. Play or demonstrate briefly again so child feels comfortable on return to classroom. Record the sound groupings given by marking as shown:

Scoring Examples:

d o g	3 phonemes	score 3
d o g	1 phoneme	score 1
d o g	2 phonemes	score 2
d o g	0 phonemes	score 0
o r ⁄ n g e ◡	1 phoneme	score 1 - the slash mark shows omitted sound. The ◡ shows extra sounds, if it is extra at the end of the word.

Scoring:

d o g	3	
b o y	2	Accept /oy/ spread out to two segments as correct, but score only 2 points.
c a k e	3	
d o o r	3	
m i l k	4	
g i r l s	4	
o r a n g e	5	
w h e e l s	4	

Score 1 point for each segmented phoneme

Sub-total Score 28

Note: For K children the phonemic separation drawl and blending need to be done more slowly than for older children. The understanding of the concept of the phoneme is the feature that is being tested.

SUBTEST B

Materials: 7 picture cards, blank under the pictures; bike, fish, boot, pants, bread, baby, runners.

Directions: The helping features, squares, are removed so child has no aid to number of blocks needed. Be sure all nine blocks are available. Mix blocks between each word trial so a new choice of number is open each time. Ask for repeat of answer if voice is too low. Oral response may drop very low if thinking very hard on number of blocks needed. Score each phoneme as shown in Subtest A.

Scoring:

b i k e	3	
f i s h	3	Do not score syllables as phonemes. Score = 0 if syllables are given.
b o o t	3	
p a n t s	5	
b r e a d	4	

b a b y	4	
r u n n e r s	5	If "n" given aloud and counted twice clearly, accept as correct but maximum score is 5.

Sub-Total Score 27

SUBTEST C

Materials: No concrete materials. Words given orally are: chair, toy, thumb, swing, dress, lunch, whistle, scamper.

Directions: All pictures and blocks are removed. Segmenting is now done mentally with an oral response, the child's own tactile sense as only aid. Demonstrate the example: /mouse/. May be repeated so understanding of test is clear. If there is a discrepancy between fingers shown and number given, repeat question, "How many?"

If a child changes to syllables on last two items, record change but give no score for phonemes. Cross out omitted phonemes.

Scoring Examples:

l u ~~n~~ c h	3 phonemes	score 3
s c a m p e r	3 phonemes	score 3
s c a m p e r	2 phonemes	score 2

Sub-total Score 30

SUBTEST D

Materials: Words given orally; mud, love, puddle, reading, table, in, the, when, since, because.

Directions: Note that the answer is a number this time. Actual mental fluent segmentation is being tested. Accept first answer given. Do all items. Score: either fully correct or not. Stop scoring after 4 errors in a row.

Sub-total Score 10

SUBTEST E

Materials: Nonsense words given orally; ud, tiz, amp, sesna, mithler.

Directions: The time limit is 10 seconds. Do not rush if still working on segmentation, but give no score if time limit is passed. Score either fully correct or not.

Sub-total Score 5

Grand Total: 100

PHONEME SEGMENTATION TEST

January, 1981

by Aula Bell

Name _____ Date of test _____
yr. mo. day

Grade ____ School _____ Date of birth _____
yr. mo. day

Teacher _____ Age _____

Examiner _____ Boy _____ Girl _____

A. Here is another card. This is a picture of a _____. Yes, it is a _____ (Correct and repeat the name of the picture if child gives a different one). You push the blocks in here (point in squares) as you say the sounds, just like we did it together. Show me the sounds in _____.

Tests

A = _____

B = _____

C = _____

D = _____

E = _____

Total _____

100

	Score
d o g	
b o y	
c a k e	
d o o r	
m i l k	
g i r l s	
o r a n g e	
w h e e l s	
28 Total	

Comments:

Rev. Feb. 9, 1981. Rev. first page (summary) June 2, 1981.

PHONEME SEGMENTATION TEST

B. This time we have no squares. Here is a picture of a _____. Yes, it is a _____ (Correct and repeat, if needed). Show me the sounds with the blocks. I want to hear the sounds.

b i k e	
f i s h	
b o o t	
p a n t s	
b r e a d	
b a b y	
r u n n e r s	
Total	

27

C. Now we are going to put the blocks away and just say words. We will count the sounds with our fingers. Ready to watch? (Touch a finger on the table for each phoneme as you say /mouse/, /m/--/ou/--/se/, /mouse/ and hold up three fingers.) Let's do it together. (Repeat with child. Any clear physical movement is acceptable for counting.) The next word is _____. You say it and show me. I want to hear the sounds.

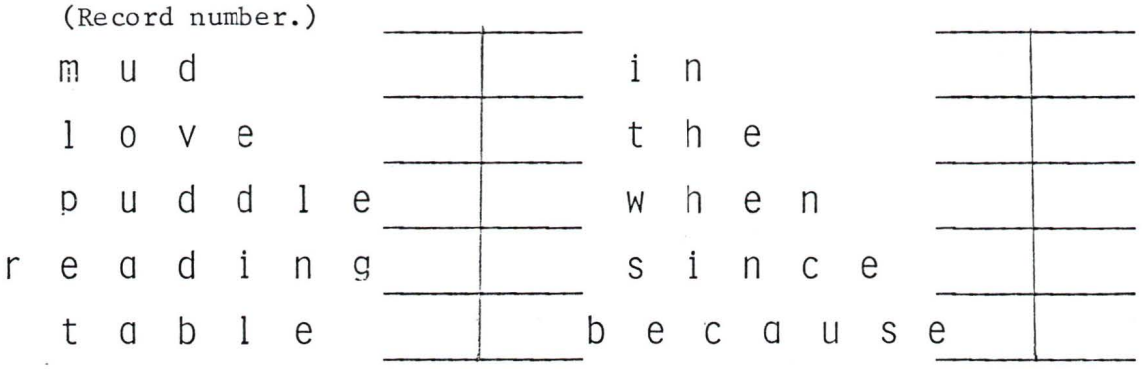
c h a i r	
t o y	
t h u m b	
s w i n g	
d r e s s	
l u n c h	
w h i s t l e	
s c a m p e r	
Total	

30

PHONEME SEGMENTATION TEST

D. Now we are going to do the same thing with sounds but this time you have to do it all in your head. Tell me how many sounds in _____.

(Record number.)



10 Total _____

E. Now we are going to do the same thing again but these words are not real words. (Say clearly, leave space of two seconds and repeat word.) Listen carefully - how many sounds in _____. (Record number.)

5 Total _____

100

Table A. Raw data and mean scores of each of the five sub-tests. The maximum possible for each sub-test is: A = 28, B = 27, C = 30, D = 10, E = 5.

Experimental Group

	Pre-test						Post-test 1						Post-test 2					
Subject	A	B	C	D	E	Total	A	B	C	D	E	Total	A	B	C	D	E	Total
1	25	16	17	4	1	63	25	17	20	6	3	71	21	18	20	5	2	66
2	4	0	-	-	-	4	12	13	12	2	0	39	14	6	6	2	0	28
3	15	13	12	1	-	41	22	16	18	4	2	62	24	15	18	4	0	61
4	21	10	2	0	-	33	24	17	21	5	1	68	22	16	15	2	0	55
5	22	9	14	0	-	45	25	16	14	1	0	56	26	16	19	3	3	67
6	22	16	22	7	1	68	27	23	26	7	2	85	27	25	29	6	3	90
7	21	14	17	1	-	53	27	16	25	2	3	73	18	19	19	2	0	58
8	26	17	14	4	1	62	22	15	14	4	2	57	26	20	14	5	1	66
9	17	11	2	-	-	30	19	8	2	3	0	32	12	8	7	0	0	27
10	22	22	20	0	-	64	28	24	25	8	3	88	20	24	17	2	0	63
11	13	8	4	-	-	25	16	10	9	2	1	38	25	16	19	4	0	64
12	23	15	16	4	1	59	27	20	22	4	1	74	25	17	18	4	2	66
13	17	7	10	-	-	28	19	16	10	2	2	49	23	12	10	3	0	48
14	2	0	-	-	-	2	2	1	-	-	-	3	2	1	7	3	0	13
15	21	14	10	-	-	45	19	17	16	3	2	57	16	16	10	0	0	42
Σ	271	172	160	21	4	622	314	229	234	53	22	852	301	229	228	45	11	814
$\bar{X}$	18.1	11.5	10.7	1.4	.3	41.7	20.9	15.3	15.6	3.5	1.5	56.8	20.1	15.3	15.2	3.	.7	54.3

Control II

	Pre-test						Post-test 1						Post-test 2					
Sub.	A	B	C	D	E	Total	A	B	C	D	E	Total	A	B	C	D	E	Total
1	24	8	10	2	2	46	15	5	6	3	0	29	24	9	12	2	1	48
2	5	0	-	-	-	5	6	6	0	-	-	12	9	2	1	-	-	12
3	13	6	3	-	-	22	16	12	13	2	0	43	27	17	17	2	0	63
4	2	-	-	-	-	2	8	3	-	-	-	11	4	8	6	-	-	18
5	21	14	16	0	0	51	19	13	14	4	0	50	20	16	13	1	0	50
6	10	4	-	-	-	14	11	5	-	-	-	16	24	16	17	4	1	62
7	2	1	-	-	-	3	5	5	3	-	-	13	6	5	1	0	0	11
8	7	4	-	-	-	11	10	9	8	1	-	28	15	16	13	1	1	46
9	0	-	-	-	-	0	4	1	-	-	-	5	1	0	-	-	-	1
10	3	0	-	-	-	3	2	0	-	-	-	2	5	5	3	0	-	13
11	5	0	-	-	-	5	6	6	8	2	0	22	10	7	5	0	-	22
12	28	18	17	3	0	66	25	17	23	4	2	71	24	17	19	1	-	61
13	16	16	10	0	-	42	11	6	15	0	-	32	20	16	12	3	2	53
14	25	16	17	5	4	67	27	19	16	3	2	67						
15	19	7	11	3	1	41	17	9	4	3	1	34	21	14	15	4	3	57
Σ	180	174	84	13	7	378	182	126	110	22	5	435	210	148	134	18	8	517
$\bar{X}$	12.0	11.6	5.6	.9	.5	25.2	12.1	8.4	7.3	1.5	0.3	29.0	15	10.6	9.6	1.3	0.6	36.9

Control III Group

	Pre-test						Post-test 1						Post-test 2					
Sub.	A	B	C	D	E	Total	A	B	C	D	E	Total	A	B	C	D	E	Total
1	4	0	-	-	-	4	5	7	3	-	-	15	7	10	8	4	2	31
2	13	12	19	3	2	49	15	4	5	-	-	24	22	16	14	2	1	55
3	24	16	22	5	2	69	23	14	12	4	1	54	19	13	13	3	0	48
4	1	0	-	-	-	1	0	-	-	-	-	0	6	2	3	2	0	13
5	1	-	-	-	-	1	6	3	0	-	-	9	18	11	11	3	3	46
6	4	6	-	-	-	10	6	2	0	-	-	8	17	13	9	0	0	39
7	8	1	-	-	-	9	8	1	0	-	-	9	8	3	9	3	1	24
8	0	-	-	-	-	0	3	2	0	-	-	5	15	6	7	2	0	30
9	0	0	-	-	-	0	11	6	0	-	-	17	8	2	3	0	0	13
Σ	55	35	41	8	4	143	77	39	20	4	1	141	120	76	77	19	7	299
$\bar{X}$	6.1	3.8	4.5	0.8	0.4	15.9	8.5	4.3	2.2	0.4	0.1	15.7	13.3	8.4	8.5	1.1	0.7	33.2

Control I Group

	Pre-test							Post-test 1					
Sub.	A	B	C	D	E	Total		A	B	C	D	E	Total
1	22	18	17	5	1	63		14	14	12	3	0	42
2	8	-	-	-	-	8		12	10	3	2	0	27
3	4	-	-	-	-	4		11	8	6	1	-	26
4	24	8	9	0	-	41		15	16	12	6	2	51
5	25	15	16	3	2	61		13	10	7	1	1	32
6	20	8	18	0	0	46		24	13	13	5	2	57
7	22	19	21	5	3	70		19	20	22	6	1	68
Σ	125	68	81	13	6	293		108	91	75	24	5	303
$\bar{X}$	17.8	9.7	11.6	1.8	0.8	41.9		15.4	13.0	10.7	3.4	0.7	43.3

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Phoneme Segmentation in the Acquisition of Reading

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