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THE RELATIONSHIPS BETWEEN LANGUAGE AND READING

Patricia Frantz

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1. Introduction

Many of the skills employed by a child in learning about speech are also relevant to the task of learning to read. An understanding of the rapid manner in which speech is acquired also provides an insight into the remarkable cognitive capacity of a child in his early years. Speech is a primary-linguistic activity; reading is a secondary language-based skill, dependent on speech. Reading is a specialized and complex skill involving a number of more general skills that have to be investigated and understood. Both speech and reading processes can be viewed as a progressive endeavor to discover relevant category and equivalence rules.

2. Communication and Information

A communication transaction requires two people - a transmitter and a receiver of a message. Both have to contribute to communicate. The task of the receiver may be more difficult

than that of the transmitter. The receiver must have skills of language comprehension equal to the skills of the language production of the transmitter because the receiver may need to interpret messages that include elements, structure, or content quite foreign to his own experience. The transmitter does not have to go beyond his own vocabulary or syntax; also he can afford to be discursive because he knows the point that he is going to make.

Information is the reduction of uncertainty. Consider the number of alternatives among which the speaker has to choose defined in terms of the number of alternative decisions that could be made no matter what the alternatives are. If reading can be treated like any other process of acquiring information, namely the reduction of uncertainty, then the three areas of letter identification, word identification, and "reading for comprehension" can be considered in the same light. In each case, information is acquired visually to reduce a number of alternative possibilities.

Redundancy is the most important concept in communication and exists whenever information is duplicated by more than one source. There is redundancy whenever the same alternative can be eliminated in more than one way. An obvious way to provide redundancy is to repeat everything. With this method the alternative sources of information are the two successive sentences.

A different method of redundancy is to present the same message simultaneously but one to the eye and one to the ear via audio-visual or multi-media approach. This reduces the

likelihood that the receiver will make the mistake of overlooking anything in comprehending the message. The same is true in reading - the larger the context, the greater the redundancy. The more redundancy the less visual information the skilled reader requires.

By the time the speaker starts to express something, the configuration of his vocal tract has changed, depending on the vowel that is to follow the consonant. So if what the speaker does has anything to do with what the listener hears, the listener must be responding to a portion of the speaker's behavior that is silent. A phoneme may have no independent or distinctive physical identification of its own: it may be produced in a variety of ways, and vary radically depending on the sound around it, yet still be heard as the same. The phoneme is not present at the surface level of spoken language [Smith, 1971]. The phoneme is something that the speaker constructs. When listening to speech, significant differences are heard - not different sounds, but phonemes instead of phones.

The fact that one needs to ~~KNOW~~ a language in order to ~~HEAR~~ it properly becomes apparent when one listens to a foreign language. One cannot distinguish what the distinctive sounds of the language are or tell how many words there are, or even divide up utterances and make word breaks. Smith's point is that of the infinite number of possible and actual differences in the superficial physical manifestation of language, only a few are actually significant for comprehension of the meaning. Many of the important differences are not apparent. The

differences we hear are those that are significant whether or not they actually occur. The sender communicates or sends sound but the meaning is at the receiver end. It is not that the listener interprets sound to get meaning, but he needs to know meaning before he can hear sound.

Very deeply involved in this view is the concept that reading is not a matter of going from words to meaning but rather from meaning to words. To read words effectively, one needs to have a good idea in advance of what is being read e.g., broadcasters read bulletins before broadcast time so they can read the material effectively. Study into the manner in which children learn to speak and understand spoken language can provide considerable insight into the manner in which they might approach the task of learning to read.

3. The Acquisition of Language

Spoken language is literally self-taught. The process of language learning proceeds in an extremely rapid, smooth, predictable sequence, indicating that a child is well-equipped biologically both to use and to learn language. In the language-learning process, the production of speech is inseparably connected with the reception of speech, and the learning of both go forward together in the young child. D.Fry [1966] suggests three aspects of development of speech are the learning of the motor skills, the mastery of cues for recognition, and the buildup of the store of linguistic knowledge that eventually forms the basis for both the production and reception of speech. The amount of speech a baby hears in situations that interest

him, like feeding, bathing, dressing, is important for the future development of his speech. His ability to listen is continually extended and exercised by the variety of situations and the variety of speech associated with them.

Another important development is the establishment of the auditory feedback loop to the brain. As sound-producing movements are repeated, a strong link is forged between kinesthetic impressions and auditory sensations that the child receives from his own utterances. The auditory stimulus from the outside starts up a complex of motor and auditory activity in the child [D.Fry, 1966].

Ruth Weir [1966] hypothesizes that pitch or intonation patterns may be signals perceived by the child and these are learned early, perhaps independently of segmental phonemes. In experiments with 6 - 7 month old Chinese (Mandarin), Assyrian, American, and Russian infants, the intonation patterns of the Chinese child were much more pronounced and varied than those of the other babies.

Language is not a natural organic part of growing up. Children who grow up isolated from human society do not develop language. Thus the development of the physical coordination necessary for speech begins before speech, but language development does not wait for physical maturation and coordination. D.Fry [1966] states that it is clear that babbling sensations play an important part in speech development. The auditory stimulation must not cease and the all-important links between motor activity of speech and auditory feedback must be established. In deaf children, the babbling develops as in a normal

child, but fades because he lacks the auditory stimulus from his own babbling. It has been found that babbling may continue for a time but will become dependent upon the child's being able to see the adult speaking to him.

During the babbling stage two important things happen:

1) the child is learning the acoustic effect of making certain movements and finding out how to repeat them;

2) the child is establishing circuits by which motor activity and auditory impressions are firmly linked together.

The appearance in child speech of a new formal device serves only to code a function which the child has already understood and expressed implicitly. The child must have both cognitive and linguistic discovery procedures available in order to formulate internal structures which are capable of assimilating and relating both linguistic and non-linguistic data, and which are capable of realizing intentions as utterances.

Infants' early attempt at vocal communication are quite different from adult language in important ways. The important question is not what part of speech a word is in the adult language but what role it plays in the child's language system. D.Slobin [1971] states that children form a variety of word categories of their own based on functions of words in their system. Their words must be looked at in the light of the child's total system. He can communicate complex underlying thoughts through single word-utterances. E.g. "Drink" could mean "bring me a drink"; or "look at that drink," or "I didn't like that drink so I threw it all over the floor." Knowing whether the child produces only what he comprehends or comprehends only

what he produces is important since this knowledge can lead to a better explanation of the techniques the child uses to acquire a language.

When it comes to articulation and the development of the phonological system it seems that imitation does play a very important role, but not in the sense of aping an adult model. Similarities in pronunciation do exist and are very strong. First the child learns to produce intonation successfully which is closely related to the affective side of speech, which grows naturally out of expressive sounds the child makes. There is a strong emotional tie between the mother and the baby as the child imitates the mood and tone of the mother. He associates his imitation, utterance, and response to the situation in which the intonation is used. He recognizes words in association with a given situation. By trial and experimentation and usage he evokes the desired response and encouragement.

Paula Menyuk [1969] states that children proceed from single-morpheme utterances to utterances which contain two or more morphemes because of the necessity of conveying more specific meaning in an expanding world in an economic manner. When a child starts putting two or more words together, one can begin investigating his active grammar.

Dan Slobin [1971] calls two or more word constructions, "pivot" constructions. They serve a variety of functions in the child's speech. Pivot constructions are basic constructions of human language found in child speech of all cultural groups yet studied. They have functions which by and large are not characteristic of communication systems in other primates.

The child's ability to think symbolically and to produce sound symbols makes it possible for him to learn language. He uses language to express himself and his needs and begins to manipulate his perceptions of the world by mentally manipulating language. Therefore thought becomes verbal. Language becomes a convenient symbolic medium for thought.

Language is used to describe the world and to manipulate people. Subject-predicate constructions can be discerned from the start in the pivot constructions; both quantitative and qualitative modification appear early; some form of negation is present. The child is aware of semantic relationships and can express them fully in a single two-word sentence; therefore an important aspect of grammar development is the ability to produce longer utterances in which subparts of an utterance bear grammatical relations to one another.

Basic organizing principles of language emerge very early. The child expands his utterances as constituent constructions. Sentences are not mere strings of words but hierarchies of units organized according to grammatical principles. The child apparently operates on these basic and universal principles even when composing short, idiosyncratic childish utterances. He notices distinct but parallel elements in utterances that are otherwise the same, and generalizes patterns in which certain elements can be interchanged. The process of generalization about patterns and rules for their formation and for interchangeability of elements is more abstract and complex than the process of expansion in the previous stage of development. The child must reflect on the utterance,

generalize the pattern, introduce a rule, generate an utterance consistent with the rule, evaluate the rule and modify to learn the limits of the rule, according to Slobin [1971].

The child could not acquire control over rules, patterns, inflectional endings, function words, or intonation systems without testing his generalizations as they were formed. Children who are prevented or discouraged from making errors in this stage may be reluctant to try out generalizations and may remain in a less effective stage of learned wholes. Words and phrases take on meaning as the word has lexical, dictionary meaning and also contextual meaning. The child's large vocabulary serves as a check on generalizations about language structure and word or phrase meaning and he develops a feeling and intuition for language.

His speech deviates from adult speech in a systematic fashion. It is creatively constructed by the child on the basis of partial analysis of language and inherent cognitive tendencies of his mind. Children begin by using regular forms of past tense verbs correctly, then overextend the past tense rule to irregular verbs. Apparently children learn past tenses of irregular verbs correctly, e.g., came, broke. went, done. etc. Then they learn regular past tense forms and replace irregular forms with regular forms, e.g., comed, goed, breaked. etc. The over-regularization is applied to all past tense forms then in the child's grammar. The crucial point is that irregular forms do not follow regular patterns and children are especially sensitive to patterned regularities. The child seeks to create order in his language.

He notes the regularities of behavior, the normative sense of rules (he's able to judge if an utterance is correct with respect to some linguistic standard in his sense of grammaticality), and tests his rules by correcting himself with the next utterance, and sometimes corrects others' speech; and he detects deviations from regularity in his speech and that of others. Ursula Bellugi [1971] states that the child analyzes the sentence he hears, and reconstructs his responses in accordance with his own rule system, preserving the semantic nature of the message.

The child has an innate means of processing information and forming internal structures. When applied to the speech he hears, he succeeds in constructing a grammar of his native language. The biologically-determined "critical stage" for language acquisition is in early childhood, according to most analysts.

A child's speech is not a mimicry of adult speech. It has been proven that a child cannot successfully imitate structures which he is not capable of producing on his own. Even if a child could imitate all the utterances he hears, he would not understand how to go on to produce new utterances which he has not heard before. The same linguistic competence must underlie both production and interpretation of speech.

Paula Menyuk [1969] describes one aspect of maturation in grammatical competence as "increasing memory capacity", measured not in terms of sentence length or the number of morphemes in a sentence, but in terms of his capacity for basic structures

and elaborated structures which require an increasingly differentiated and larger number of rules for their generation.

The ability to apply rules like pluralization presupposes the ability to perform analyses such^{as} dividing words into a final sound plus the rest of the word, and classifying the former into three distinct classes, e.g., -iz, -s, -z. Halle [1968] notes that the astounding thing is that three-year-olds perform all these acts naturally and don't have to be taught the plural rule. They learn it for themselves, easily, simply, quickly, unconsciously. He claims that language is a special manifestation of man's innate ability to manipulate symbols.

Carol Chomsky [1969] found that after age five the rate of acquisition of syntactic structures decreased markedly and that differences between child's grammar and adult's grammar are no longer so readily discernible in child's spontaneous speech. This is brought to light when a child's comprehension of particular syntactic structures is explored. A complete knowledge of a word includes both semantic knowledge and all the syntactic knowledge relating to the word.

Basically a child is equipped with every skill needed to learn to read and write. He just needs to discover the particular rules that apply. Smith [1971] states that the role and responsibility of the adult in the child's acquisition of language is to give the child credit for knowing about learning language; and to speak adult language to him to reinforce correction of the child's acquisition. The adult provides the child with the information when he needs it by regarding every utterance as having a double function: as an expression of a feeling or

need, and of testing a rule.

4. Effects of Language upon Cognition

Behaviorists believe that all learning is habit formation. The only data of importance are the observable circumstances in which habits are established. Behaviorists are interested in creatures of habit.

Cognitivists believe that learning is the acquisition of knowledge, the unobservable manner in which information is acquired and organized by the brain. Cognitivists are interested in creatures who think. Cognitive psychologists see human beings as "information processors" [Smith 1971] or consumers of information. They say language skills cannot be explained as habits established by conditioning of stimulus-response bonds. The response of comprehension must be based on understanding of rules rather than the development of habits. Individual behavior seeks, acquires, organizes, retrieves, and uses information selectively, not haphazardly as the behaviorists purport.

Behaviorists believe that each individual has a theory of what the world is like - they have an internal store of information based on past experience and can make predictions of future constructions. Individuals make decisions based on two kinds of evidence: 1) current information received from the environment by the receptor systems; 2) stored information available in the memory. One of the central tenets of the cognitivist position is that perception, like remembering, is a constructive process, built from minimal information by filling in missing information in the direction of what we expect, or

want, the missing parts to be. Cognitivists make a linguistic assertion that we only see those differences that are significant. Applied to reading, this means that the more skilled a reader is, the less visual information he needs from the page, and the more he is able to predict what unread material will be. Perception involves identification; the speaker or reader makes assumptions not given in events, then makes an interpretation. The beginning of the process is an unidentified or uninterpreted "happening" or an impact of the world on his receptor systems, such as the stimulus or visual array (especially for reading), visual configuration, or event.

Each person possesses a cognitive map of the world, a map that places environmental happenings in meaningful relationships with each other. Language may be viewed as either an external verbalization about things, or as an integral part of the personal process of experiencing and knowing. The thing is not known until it is named, Kenneth Goodman, et.al. [1970] asserts. Its interrelation with other things is not understood until language embodies the idea, in a constant interplay of interrelated experiences and language. Kolars [1968] claims that names affect our ability to see things. Names are aspects of a perceptual complex that have been artificially segmented by being given a name, and in some ways our perceiving must influence our ability to name, else nothing new would ever be named.

J.Piaget's Swiss school takes the position that cognitive development proceeds on its own, followed by linguistic development in a child's language. Piaget believes that the child's intellect grows through interaction with things and

people in his environment and that language is involved in interaction and may amplify or facilitate development, but does not in itself bring about cognitive growth. He stresses the role of naturally-developing cognitive growth as the child interacts with his environment. He claims that language does aid in the storage and retrieval of relevant information, and he maintains the primacy of cognitive maturation, guided by various sorts of experience. So his philosophy is that living will move the child forward in his cognitive development.

L.S.Vygotsky, a Russian with Soviet Union orientation, suggests that the tasks with which society confronts a child prompt initiation of cognitive processes. Language and thought are closely linked in childhood (i.e., when the child thinks, he talks) but in the course of development, adult thinking becomes free of language in some ways, at least free of overt or covert speech responses. Vygotsky stressed that all speech is social in origin and demonstrated that in situations where the child was faced with frustration or a problem, the use of speech facilitated an understanding of the problem.

Vygotsky claims that all speech is social in its origin and demonstrated that it is indeed communicative. When placed in a group of deaf-and-dumb children, or children speaking a foreign language, or even in a noisy environment, the child's own spontaneous speech dropped to almost nothing. Vygotsky found that egocentric speech becomes less and less intelligible from the ages of three to seven, finally disappearing on the overt level. This supports the notion that egocentric speech is on its way to becoming inner speech. He concludes that the primary function of speech is communication in social contact, but at a certain age, speech is divided into egocentric and

communicative speech. The function of egocentric speech is similar to that of inner speech, in that it not merely accompanies the child's activity, but serves mental orientation and conscious understanding, helps in overcoming difficulties, and is intimately and usefully connected with a child's thinking, becoming inner speech. The early interaction between the child's concepts or idea clusters and the language of his environment is crucial for the child's egocentric speech to become his inner speech that is the shorthand of thinking. Vygotsky states that inner speech is not an interior aspect of external speech but inner speech is a function in itself. He suggests that words have a vague meaning for children even before they can speak; therefore language helps shape their thinking. At each stage of the child's intellectual development, the adult's teaching of the language must be appropriately congruent with the language the child has learned.

Piaget's idea of egocentric speech and socialized speech is portrayed as a transition from one to the other. In egocentric speech, the child does not attempt to place himself at the point of view of the listener and asks no more than apparent interest, but has the illusion of being heard and understood. Egocentric speech develops into socialized speech which takes account of the point of view of the listener and makes true dialogue possible. Piaget sees the inability to decenter egocentric speech as a general cognitive phenomenon, frees himself through communication with others. He implies that the ability to communicate adequately is closely bound up with cognitive development in general.

Piaget asserts that language is an outside agent in the child's developing thought that comes to serve him by translating his personal symbols or symbolic structures into collective or

societal meanings. The child's use of language does not substantially affect his development of personal symbolic structures they are independently made. But his symbolic structuring comes before meaning; i.e., children can show without words that they understand some ideas by the way they manipulate objects in play and in problematical situations without words. Piaget sees the schemata or cognitive structures as pure thought connections involving language but not built of language.

According to J.Church [1971], Furth and Piaget claim that language is largely irrelevant to cognitive development which is under the control either of autonomously maturing internal structures or of a perceived environment. Furth's studies of children who have no spoken language indicate that their cognitive development follows the same basic stages, due to a lack of experience, considering the sort of environment in which many deaf children are raised. In a study of deaf and hearing adults, Furth finds no significant differences in basic cognitive abilities, though most of the deaf subjects could barely read, write or speak English. Furth's conclusions about the importance of language are that language does not influence intellectual development in any direct, general, or decisive way. And the influence of language may be indirect or specific and may accelerate intellectual development by providing opportunity for additional experience through giving information, exchange of ideas, furnishing ready symbols (words) and linguistic habits in specific situations. It follows then that persons deficient in linguistic experience or skill are not permanently or generally retarded in intellectual ability;

though they may be temporarily retarded during the development phase because of the lack of sufficient experience and they may be retarded on certain specific tasks in which available word symbols or linguistic habits facilitate solution.

5. Cognitive View of Learning in Relation to Language

Smith [1971] says our internal cognitive world can be considered as a filing system with two sets of rules for filing; one set of rules is concerned with how incoming information should be allocated to particular files; another set is concerned with relations among the files themselves. The files are referred to as categories with significant differences. The way in which categories are organized clearly reflects our personal interests and experience as well as the way in which the world is constructed. The rule of category allocation with respect to the elimination of alternatives applies both to perception (how we view an object or event) and description (how we believe a listener or reader would describe an object). What we see depends upon the nature of alternatives we want to exclude, e.g., one sees words if checking a directory for names, but sees letters if looking for a spelling. The way in which the world is perceived depends on the manner in which the incoming information is categorized, not simply on the characteristics of the incoming information itself. Smith describes three aspects of learning from the cognitive point of view in relation to the acquisition of language as:

- 1) the establishment of new categories,
- 2) the development of relations among categories,

3) the refinement of rules for allocation of events to categories.

Smith [1971] claims that the process of learning requires establishing new categories in order to learn significant differences. The level of specificity chosen in selecting cognitive categories depends on the number of alternatives to be eliminated. They permit us to separate our experiences into those events we wish to consider as equivalent and those we wish to differentiate. E.g., a highway patrolman may need a full description of a car after an accident. Skiers and Arctic residents require fine discriminations of snow conditions. Experiences need to be categorized but not indefinitely or experiences could never be summarized or predictions made from one event to another. A small child recognizes a man as his father and only one person is allocated to that category invariably. The eventual property list for that category becomes a rule.

Learning requires that relations between categories be made, permitting discrimination. A word has to have a name and to be meaningful it has to be plugged into a network of associations. Smith proposes that with a visual category and its associations established one can move from the printed page to meanings directly. Very often sounds of written words could not be accurately produced unless the meaning of words had already been determined.

Learning involves the discovery of more and more of the cues by which events can be allocated to categories Smith

notes that though cues and features have an obvious relationship, they are not the same as the property list. Features must be specific to the receptor system that identifies them and those features must be in the actual ink marks on paper as alternative sets of features may exist for identifying particular categories. Functionally equivalent distinctive features are features that serve for identifying an object. Criterial sets of distinctive features are features that serve to categorize an object. As the child learns, he discovers more ways to make decisions that particular events should be categorized in certain ways. The number of functionally equivalent criterial sets gets larger as less featural information is required for identification.

Edward Sapir [1912] held that all of experience is influenced by the particular language one speaks; that language habits predispose certain choices of interpretation; and that different languages are held to have different effects on thought and experience. He held to linguistic determinism -(language can determine cognition) and linguistic relativity (determinism is relative to the particular language spoken. Categories of experience in various languages are different. The differences are expressed lexically and grammatically by individual words in a lexicon; by parts of words which perform grammatical function; and by a variety of grammatical processes, e.g., word order in English.

The strong Whorfian theory holds that language determines thought and behavior patterns. Language is sort of a mold for thought and philosophy. An assumption underlying all of this work is that cognitive states are determinants of overt

behavior, or, more generally, that ways of perceiving and conceiving the world affect behavior norms toward physical objects and in social situations (culture). Because behavior influences cognition, people in different cultures will view words differently, quite apart from and beyond language factors per se [Sebeok 1965].

Slobin [1971] states that a weaker form of the Whorfian theory is held today in one way or another. He asserts that certain aspects of language can predispose people to think or act in one way or another, but there is no rigid determinism. Because culture changes much more quickly than language (hence many archaisms), then the language and not the cultural behavior is the dependent variable. Topography of geographical area in which a society lives determines both linguistic and cultural forms. Slobin maintains that linguistic relativity and determinism must bear in mind the nature of linguistic evidence, the nature of behavioral evidence, and the causal nature of the connection.

Paula Menyuk [1969] goes on to say that it is possible that changes may be introduced in the language by new generations of children. Changes in language may increase its redundancy and complexity. No language can substantially be described as being simpler than another, but it is possible that redundancies in language are necessary to the human organism in dealing with the verbal symbol system.

6. Memory

In the model that cognitivists ascribe to, there are no fewer than three kinds of memory according to Smith [1971]:

1) Sensory Store (sometimes referred to as visual image) - the raw material of perception is briefly retained here while the information-processing operations begin. (Perception is not instantaneous.) The decision making process of integrating incoming information with what is already known and expected takes a significant amount of time. Information decays rapidly and is erased by a new intake of information through the receptor.

2) Short-term memory - in which raw information is held temporarily while it is processed (identified or categorized). Less information is in the S.T.M. than sensory store as it can hold only about 4-7 separate items. The capacity is very limited and information is lost unless constantly renewed by some form of internal rehearsal. S.T.M. is disrupted if new information comes in before the information it contains has been disposed of. There is no absolute limit to how long information can be kept in S.T.M., but because we constantly want to pass new information through the bottleneck of its limited capacity, its effective duration is only a few seconds at the most.

3) Long-term memory - appears to have no storage limitations at all. Anything that ever gets into L.T.M. stays there permanently. There are two limitations that prevent using it as effectively as could be: (1) it takes time to get information into it (aggravating S.T.M. bottleneck); (2) we need special retrieval procedures (or rules) for getting information out. The reason we so often "forget" knowledge we once had is

not that it has left our L.T.M., but that we have lost the means of access to it. Nothing could be identified (which means nothing could be perceived) if a contribution were not made by L.T.M., because it is there that is lodged the knowledge of the world to which all incoming information must be referred.

In reading, as in any perceptual event, all three aspects of memory must be involved. Visual information is picked up from the printed page and held for less than a second in a sensory store. As the eyes move on, much of the information in the sensory store must necessarily be lost, but some is moved to S.T.M., where it is held for a few seconds while more information from the sensory store is acquired.

Because the space in the S.T.M. is so limited, it can contain only four or five, up to seven elements at any one time, but each of the elements may be a single letter or word or morpheme, or a meaning extracted from several words. Because sentence meaning cannot be determined on a sequential word-by-word basis, information from several words has to be held in S.T.M. at any one time. The load on S.T.M. can be reduced by chunking information into larger units and this involves making the use of syntactic and semantic information already stored in L.T.M.

Many memories are distorted just because they are stored in verbal form and because not everything can be accurately represented in a verbal summary. To a certain extent we remember events the way we want to, states Smith [1971]; memories are often changed to match our prejudices or desires so they will become more plausible or acceptable to us. This phenomenon of schematization in memory is what George Miller

refers to as recoding in his very important article on memory, "The magical number seven, plus or minus two" [1956]. He concludes that one can hold no more than $7 \pm$ "chunks" of information in the immediate memory (S.T.M.). He discusses cognitive economy which comes about by lumping many things together into one chunk. It is necessary to have this sort of schematization in memory so what we remember can be reduced to the point where we can deal with a summary of some sort. In other words, there is not enough space in the L.T.M. to store every single second of every single day or the incidences that are to be remembered, so the schematization summarizes economically.

There are two major problems with memory storage and retrieval. Schachtel [1959] in Slobin [1971] argues that the early autobiographical memory may be impossible for strictly cognitive reasons because (p105) "The categories (or schemata) for adult memory are not suitable receptacles for early childhood experiences and therefore not fit to preserve these experiences and enable their recall. The functional capacity of the conscious, adult memory is usually limited to those types of experience which the adult consciously makes and is capable of making."

In other words, the child's way of perceiving the world is so different from that of the adult that the two worlds are almost mutually incomprehensible. The reasons are that cognitive development takes place in the process of growing up; and adults talk about their experiences and memories and tend to code and store memories linguistically.

The problem is that the child has no schemata, no internal interpretive framework for preservation of his very earliest memories; those schemata which he learns later in his childhood are not appropriate for interpretation or re-coding of his early experience. We can't imagine what the world looks like to a child before he has developed concepts such as object permanence or conservation of quantity. As he grows bigger, objects change in relative size for the child. Objects are being labelled, organized, grouped and regrouped into new categories on the basis of the language he is learning. Another important difference in childhood experience [Smith 1971] is that the child relies most heavily on proximity senses (smell, taste, touch) and only later do distance senses (sight, hearing) become dominant. English has an inadequate vocabulary for expressing proximity senses but a most adequate vocabulary for describing experiences of distance senses. So most of the child's early memories are connected with stimuli that are no longer available to him; stimuli fall into categories different from later learned categories; and stimuli are seen from a different vantage point from that of an adult.

According to Slobin [1971] there are at least three major means available for representing experience: action, imagery, and language. People learn manipulative skills, visual configuration, social customs, science, history, etc. With age, visual imagery seems to play a more important role, but there is a difference in the way children and adults use imagery: 1) children use more imagery in carrying out intellectual tasks; 2) their imagery is more particularistic, rather than generic

and schematic; 3) children's images seem to have greater vividness and detail.

7. The Brain and Eye Relationships

The cognitive picture of man is of an active and selective information-gathering individual who acquires and interprets new knowledge on the basis of rules already stored in his brain. Smith [1971] argues that this is especially true in language activities, e.g., listening and reading, where there is insufficient information in the signal from the outside world for transmission of knowledge without a significant contribution on the part of the receiver.

The visual system is primarily constructive, in that the information contributed by the brain is very much greater than the information it receives from the eye (reading need not be regarded primarily as a visual process).

Our eyes are not continually open to information from the world, but rather take sporadic "gulps" of information that the brain digests over time; most of the time when we are seeing, our eyes are functionally blind. That is to say, the eye does not acquire and transmit information randomly, but functions according to very precise instructions received from the brain.

Perception is constructive and we structure and fill in the gaps of our visual world more on the basis of what we expect than on what is actually there. Rays of light that impinge on the eye do not in themselves carry the color, form, texture, and movement that we see, but the familiar and meaningful aspects of perception are generated by the brain itself. Smith claims

these aspects are a response that has no one-to-one correspondence with stimulus.

Visual constancies provide a way in which the brain imposes order and meaning on what is presented to the eye, e.g., a known object is seen as a constant size. We can distinguish distinctive forms (dogs, chairs, and all other objects not present in the input) because we already know the forms we want to separate.

Contralaterality is the particular relationship with the brain for almost all parts and functions of the body. All muscle groups on the left side of the body are controlled by the right hemisphere of the brain, while the right side of the body is controlled by the left hemisphere. One notable activity that is not contralaterally represented in the human brain is language. The language control is located in a different area of only one hemisphere, usually the left.

The primary visual areas of the brain are located at the back of the brain, one on each side of the brain. In front of each primary visual area is a secondary association area, where information from the primary area is directed and where the integration of visual and other information seems to take place, culminating in the sensation of seeing. The only condition necessary for vision is neural activity in relatively circumscribed areas of the brain. Not only does the brain select and organize information that is available through the eyes, but for most of the time that we are seeing, the services of the eyes are dispensed with altogether.

The fact that the eye is open and exposed to stimulation

by light is no indication that visual information is being received and processed by the brain. The eye is exposed to much more information than the brain can use. The brain selects and processes only as much information as it can handle. The eyes pick up usable information for only a fraction of the time they are open. It has been found that what information could be perceived in a single brief presentation depended on what was presented and the viewer's prior knowledge. Viewers make use of the largest possible units, words rather than letters, meanings rather than isolated words. There appears to be a limit to the amount of information that can be acquired in a single exposure or fixation of the brain.

Smith [1971] has studied experiments made with a tachistoscope, a device that can present information to the eyes for very brief periods of time. The knowledge that has been gained from tachistoscopic studies could make an enormous contribution to the understanding of what goes on behind the eyeballs during reading. It has provided particularly important insights into the difficulties of a child who is learning to read.

Smith draws three conclusions that would seem to have inescapable implications for understanding the reading process:

1) the reader has to be fast - the information that he gets from the printed page is not available to him continuously, but is delivered "in packages" about 4 times/second to a sensory store, the visual image, where it stays for not much more than half a second.

2) the reader must be selective - must choose the 4 or 5

items that will best meet his information needs;

3) reader must be able to use prior knowledge in order to process information that is available to him in larger and larger units. It is a common experience that when a passage is so difficult that we have to read it word by word, we have to reread it afterwards in order to acquire actual meaning.

The brain tells the eye when it has gotten all the visual information it requires from a fixation, and directs the eye very precisely where to move next, depending on whether the next information the brain requires is further ahead or further back on the page. The brain always "knows" where it is sending the eye in reading as in other forms of vision. The eye movement that is really of concern in reading is a jumpy, irregular, spasmodic, but surprisingly accurate leap from one position to another. It is called a saccade, meaning 'jerk'. Saccades are generally regarded as proceeding from left to right across the page, although eye movements can also take us from the top of the page to the bottom of the page, etc. The sole purpose of a saccade, in whatever direction, is to move the eye from one position to another in order to pick up more information. All readers, good and poor, make a regression, that is a saccade that goes in the opposite direction from the line of type. Huey [1968] thought that the rate of regression (backward fixations) decreases with age and experience.

A fixation is a single intake of visual information and requires about a quarter of a second to process. Faced with a moderately difficult passage, the skilled reader will produce as many regressions as the beginning reader with a passage that he finds relatively easy. The reader who does not make

any regressions is probably reading too slowly, he is not taking enough chances. When a child makes a lot of regressions it is a signal that he is having difficulty. The number of regressions that a reader makes is a cue to the difficulty of the passage he is trying to read.

The skilled reader needs no more visual information to identify a word than a beginner needs to identify a couple of letters because all the additional information that the skilled reader requires is contributed by his prior knowledge of the language. To return to the earlier definition of information as the reduction of uncertainty, Smith [1971] states that the reason that a skilled reader does not require as much visual information as a beginner to identify a word, is that he already knows so much more that his uncertainty is much less to begin with.

8. Reading Acquisition

Eleanor Gibson [1972] defines reading as a cognitive process that starts with perception, requires perceptual learning of many things, and ends up as a conceptual process. Reading is a tool for thinking and learning that can take the place of first hand experience.

David Reed [1970] states that the process of reading is the identification of linguistic forms through viewing graphic symbols by which they are conventionally represented in a given language. E.B. Huey [1908] viewed reading as an information-processing activity, one in which an arbitrary conventional set of symbols is used to transfer information from one mind to another.

Slobin [1971] argues that speech is a tangible, physical process resulting in the production of speech sounds. Language is an intangible system of meanings and linguistic structures. Gibson [1972] goes on to state that the psychological basis of language is abstraction. The meaning of an event and the symbolic semantic referent must converge, their redundancy be noticed, and the usefulness of this redundancy be appreciated.

The human brain does not function by learning rules or lists; Smith [1971] states that the brain learns by looking for significant differences (distinctive features), establishing functional equivalences (new categories), and deciding how events go together (relation of categories). The brain does not need to be told what to do but needs to know if it is right or wrong in its decisions about what should be treated as different or the same, and how events should be associated. Smith declares that this is how a child learns to read - by drawing conclusions about similarities, differences and associations. The key to learning any skill is by example, use and feedback.

Eleanor Gibson [1972] discusses perceptual learning as learning to distinguish: distinctive features of things, e.g., faces, apples, trees, voices; representations of things (especially symbolic ones, e.g., letters, printed words); invariants of events, e.g., size, shape constancy, categories; structure of many orders. Distinctive features have relational structures with many levels of complexity, structure of language, and structural relations for reading.

Smith [1971] states that every process of reading can be seen as a process of categorization:

Identification of letters - allocates the incoming visual configurations into a set of 26 pre-established categories (associated with the names of the letters of the English Alphabet);

Identification of words - allocates the visual information to a much larger set of categories;

Reading for comprehension (Identification of meaning) - allocates visual information to the category structures that represent meaning to the reader.

The same visual information is utilized, but allocated cognitively in a different way in each process.

Smith [1971] who only describes the methods of teaching and does not ascribe to any one method, states there are traditionally 3 theories of word recognition:

(1) whole word identification - is based on the premise that readers do not stop to identify individual letters (or groups of letters), integrates this alphabetic information for the identification of the word (but knowledge of the alphabet and the "sounds of letters" is irrelevant to reading). If a word can be identified as easily as a letter, it must be a unit.

The word must be recognizable as a whole rather than as a sequence of letters. Words may be identified when none of their component letters is clearly discriminable, e.g., distant road sign in dim light. Words can be identified as fast as letters. But the capacity of the short-term memory seems to limit the rate of visual recognition - no faster than 5 or 6 units a second.

(2) letter by letter identification - readers are sensitive to the predictability of letter sequences. The word identification must be accomplished by sounding out individual letters. This does not offer a satisfactory explanation of how the basic identification process takes place.

(3) letter clusters, usually "spelling patterns" - easy identifiability of nonwords; still a question of how clusters are learned and identified.

Any approach has inadequacies that are partly met by an opposing view and none is mutually exclusive.

The feature-analytic alternative approach to reading proposes that words are indeed identified as wholes but the manner of their identification involves precisely the same internal mechanisms as the identification of letters; that is, it makes use of the same kind of visual information.

There are two sources of information available for identification of words: one is featural (visual identity available to the eye); the other is sequential (knowledge of the way words are constructed). When there is an overlap between featural and sequential information redundancy exists. The difference between letter and word identification is simply the category system involved or the manner in which the featural information is allocated, according to Smith [1971].

Immediate word identification is defined as the allocation of a visual configuration to a word category directly from the analysis of its features. The normal reading process is "immediate" because there are no intermediate stages involving

the allocation of parts of the configuration to other categories such as letters on the way to identification of the word as a whole, from sight to meaning.

Phonics is not phonetics (the scientific study of sounds of a language). Phonics is fundamentally a hope underlying a teaching technique. Phonics is complicated. In order to teach a child a master of phonics, Smith states that there are 166 rules (which still are not enough to account for the hundreds of words that the child might expect to meet in his early reading) that must be taught. The most to be expected from phonics is that the rules will provide a clue to the sound of the configuration being examined. Not all alternatives will be eliminated by phonic rules. A reliance on the phonic methods will involve the reader is so much delay that his short-term memory will be overloaded and he will lose the sense of what he is reading. The reader will rely too heavily on rules and not acquire speed.

The phonic approach, the letter-cluster view, and the identification by analogy all appear to have basic aspects in common - they all assume that letters or groups of letters within the visual configuration must be identified; that a sound for the entire configuration is synthesized from sounds appropriate to identified letters; and that word identification will follow upon production of the resultant sounds.

The feature-analytic model might accomplish everything the phonic, letter-cluster, or analogy approaches to mediated
word identification
word identification set out to do without postulating a laborious

procedure of letter identification and sound synthesis which a reader is obviously able to dispense with in practise. Skilled readers demonstrate both immediate and mediated word identification as well as other skills of letter identification and comprehension; and in particular they are able to identify words new in their visual experience without seeming to stop to identify individual letters or laboriously to try out alternative sounds.

Mediated word identification is not as easy as immediate identification, yet the beginner has to identify many more of his words by mediating methods than does the fluent reader. The phonic approach is relatively inefficient because it involves a large number of rules that to a child must appear particularly arbitrary. The use of phonic rules is the slowest method of identifying words because the limited information-processing and memory capacity of the visual system cannot tolerate a slow rate of reading. Smith [1971] states that the fact that the child may develop competent skills of mediated word identification after phonics instruction doesn't mean he is using phonic rules as such; but the phonics instruction gave him enough information to establish his own categories and rules at a featural level. As stated earlier, the human brain functions by looking for the significant differences, establishing functional equivalences, and decoding the relations of events.

R. Conrad [1972] argues that the fact that reading is accompanied by electrical activity in the muscles required in

the production of speech sounds, though no movement is visible to the eye, should be taken as evidence for occurrence of silent articulation of speech during reading.

Philip Gough [1972] assumes that we do read letter by letter, serially (according to eye fixations, one every 10 or 20 mseconds) into some form of character register. He goes on to state that the reader goes from print to meaning by way of speech, by applying orthographic rules to the contents of the character register, converting them to ("internal") speech, and then listens to himself. All the reader should add to his cognitive equipment are orthographic rules. Nothing needs to be added to his lexicon; no new retrieval system needs to be constructed.

Gibson [1972] states that if a reader can decode a written word to its phonological representation, then he hears it and presumably might discover its meaning at once. Reading is a mapping of meanings to written symbols for things, events, ideas; written words are symbols for spoken words.

Kavanagh [1972] seems to say that for the efficient reader, a mental acoustic image is a product of understanding what is read, rather than the means for understanding.

But the reader's comprehension is not the result of the simple transmission of graphic symbols to his mind but the result of a construction he makes. Word meanings do not exist in isolation in the reader's mind like so many entries in a dictionary, but word meanings come from what he is reading, and what he expects to read, e.g., the phrase, clause or sentence where the words appear, according to Huey [1968].

Smith defines comprehension as the extraction of meaning from the text, as the reduction of uncertainty; a process that results in the elimination of alternatives. Because of channel limitations of the visual information-processing and short-term memory systems, only a limited amount of visual information can be processed within a given period of time. The less a reader depends on his visual information, the more he is able to overcome the limitations of his visual system and can read fast. He depends less on visual information when he makes use of information from other sources, notably an understanding of what the passage is about.

Redundancy facilitates the reading process by making far less visual information necessary. When reading for meaning, the reader does not actually put words into his short-term memory, but uses visual information directly for comprehension. Knowledge of the redundancy constitutes a readily available, internalized source of information that reduces the amount of visual information required to read.

Reading for meaning entails making use of information simultaneously at both the surface and deep structures of language by using elements of both visual and semantic information. He discriminates the visual features and uses his knowledge of the grammar to associate them with the developing semantic interpretation with a minimum of visual interpretation.

The distinctive features that are available to distinguish one visual configuration from another can be used to eliminate cognitive alternatives - not alternative words, but alternative meanings, thus immediate meaning identification.

Smith [1971] declares that both in listening and reading for meaning, the identification of individual words merely gets in the way. Therefore mediated identification of meaning in reading may be doubly disruptive, and slow the reading process and overload the visual information processing and memory system. Mediated reading is required to support immediate identification whenever the reader meets material that goes beyond his previous experience. The skilled reader uses the mediated reading technique as little as possible. Immediate comprehension is synonymous with facile and interesting reading. The more difficulty a reader has, the slower he reads. This is caused by his inability to make full use of syntactic and semantic redundancy of nonvisual sources of information.

9. Linguistic Awareness - Reading Readiness

Educators are shifting their attention from strictly linguistic considerations to a concern for the reader's need in orthography design. Writing symbols make no sense to the reader unless he is first aware of the units which the symbols represent. The reader has to be aware of what is going on in speaking and listening activities in order to shift to visual activities of language. Kavanagh [1972] and others agree that there are extensive areas in semantics, syntax, and speech perception that are part of the speaker's competence in his native language. The speaker is able to construct and re-construct sentences that are grammatically and phonologically correct according to his system. He not only knows the rules

of his language but has a set of strategies for linguistic performance. These strategies rely upon context as well as upon information about phonetic representation being matched and are strong enough to ensure that the speaker-hearer synthesizes (constructs and reconstructs) the "right" sentence most of the time. When he synthesizes a particular utterance, he is aware in some way of having done so. However, his linguistic awareness is far from being evenly distributed over all phases of his linguistic activity. His knowledge of meaning and construction are evident from his awareness of the grammaticality of an utterance or the lack of it. He may not have any direct awareness of many of the acoustic cues, but his awareness can be increased with ear-training. On the phonological level, not only distinctions between deviant and acceptable utterances can be noted, but also reference to various structural units becomes possible.

Synthesis of an utterance is one thing; the awareness of the process of synthesis is quite another. Linguistic awareness is by no means only a passive phenomenon, and the speaker can use his awareness to control quite consciously his linguistic activity. According to J. Kavanagh [1972] without this active aspect of linguistic awareness, much of our thinking would be impossible.

Reading depends ultimately on linguistic awareness and the degree of awareness varies considerably from person to person. Ray Gordon [personal correspondence] notes that some phonics programs have inadvertently taught awareness of phonological units and thus have made an improvement in reading

instruction, but it was the "awareness" not the phonics. Any unit that is encoded in an orthography must be brought into the awareness of the potential reader before the encoded form can have any meaning or relevance to meaningful reading.

Kavanagh [1972] thinks the reader forms a phonetic representation in silent reading, in view of the complex interaction between levels which must take place in speech. Even though writing systems are essentially phonological, linguistic awareness is in part phonetic.

Because of the way a child acquires spoken language, he is equipped with highly-developed discovery skills that he brings to reading acquisition. The teacher can capitalize on these skills in order to bring to a conscious awareness in the child the things that are psychologically real in his linguistic competence.

10. Reading Motivation

Burke [1908] stated that even back then there was a high correlation between reading disability and school failure; also a high correlation between school failure and low self-esteem or social failure. G.E.Blom, aite, and Zimet [1970] studied the motivational content of first grade readers. It was shown that boys have more reading difficulties than girls for several reasons:

- 1) the primers depict upper middle-class people, unrelated to real-life situations of the children, with much pollyannish content;
- 2) the stories depicted activities that in life are most frequently engaged in by children younger than first graders, and by girls rather than by boys;

3) in many stories the children's attempts to plan and carry out constructive activities were frustrated by one agent or another; masculine activities were frustrated more often than feminine activities.

Multi-ethnic reading textbooks and traditional textbooks show a difference in the measurements of word recognition, oral reading accuracy, and interest appeal. The important influences in the development of reading ability are (depiction of reality, age, sex, outcome characteristics of activities in the stories, the establishment of a more clearly defined sex role identity) of developmental importance in the life of the six-year-old child.

Another relevant consideration is the tendency of the six-year-old- to identify with his peers and adults. This suggests the degree of similarity between the child and his environment and the story characters and their environment.

In the survey of 1,307 stories reported in Blom, Ait, and Zimet, p.193 [1968], a statistical description of stories most American children read, or learn to read in first grade, is provided. The absence of stories about religion and the low frequency of stories about aesthetics and lessons from real life are in marked contrast to the content of the McGuffey Readers published prior to 1830's. It is clear that communication of moral and ethical values is avoided, and evidently, contemplative, intellectual, and creative activities are considered of less importance than active, happy events. The stories were generally bland, perhaps in an effort to teach reading more

efficiently by eliminating interfering stimuli or to avoid public controversy of any sort.

In general, strong emphasis is on vocabulary control and the mastery of basic skills, while motivational issues are neglected. Developmental studies demonstrate that by the sixth year most children follow interests generally preferred by their sex [Magan, 1964]. Boys are interested in masculine activities, interests, identities, and avoidance of girls; girls usually have feminine interests, fantasies, and personality reactions, though perhaps less strongly than boys. It is possible that the lack of differentiation in the sex roles in stories conflicts with the important development task of sex role identification. Apparently the content of reading textbooks has two functions to perform: an instrumental and a socializing function. But how does content actually affect children's attitudes and acquisition of reading skill?

Sarah Dugschinsky [1968] has found children can learn to read easily from textbooks that have unnatural, stilted language (i.e., "Oh, oh, oh! See Dick run.") because they are flexible and in effect can learn new language patterns quickly. Adults, on the other hand, are resistant to changing their language and have more difficulty learning to read if the material is stiff, stilted language. Also people are more interested in learning to read if there is something worth reading and if the material looks interesting and important.

11. Literacy

Ann Cates [1973] feels that neglecting the basic principles of learning is unforgiveable, whether this neglect is from ignorance or carelessness. e should be aware of basic principles and give constant consideration to their application in each particular situation.

- (1) Learning must start where the pupil is; considering his past experience, and move from the known to the unknown.
- (2) Learning is based on interest - motivation and stimulation.
- (3) Learning is based on security; learner needs to feel that he can meet the challenge of the situation (teacher should have an encouraging attitude, graded materials)
- (4) Learning is based on relevancy - relevant to daily life, meaningful.
- (5) Learning takes place when goals are set. The pupil should know where he is going and what he can expect as a result of the energy he puts out.
- (6) Learning takes place through activity, personal experience, questions, oral and written.
- (7) Learning takes place through identification with the teacher or people in the story, culturally oriented materials.
- (8) Learning depends on achieving satisfaction with himself, of the teacher, success.

These basic principles seem to agree with the findings of others in this important field of teaching reading. Gudschinsky [1973] concludes that the satisfactory development of skills of reading and writing are not assured unless the methods and

materials used reflect the native speaker's concepts of the internal and external relationships among various constituents of his language. He should be taught how to read in every lesson. The words that are taught should be in a natural context and the child (or adult) must realize that the lesson is not a game but something meaningful. Gudschinsky states that people learn to read more smoothly if they sound out a new word by syllables rather than by individual letters, but if the reader always has to sound out, it will slow his reading. The larger units carry the meaning by phrases and whole clauses. Function words should be taught only in context; the smallest context in which it makes sense. The reading of meaningful material should be the largest part of each class session. The drilling of syllables should be a tool for reading and not the whole purpose of the class hour.

Frank Laubach [1947] asserts that it is much more natural to teach people to read their own dialect first, because it is much easier than reading in an unknown vocabulary first.

Eugene Nida [1949] explained the principle value of using diglot primers with an introduction of the native language first, then the foreign language, was that there was less initial discouragement because students failed to understand the strange vocabulary; there was greater interest because the subject matter and the language were thoroughly familiar to them; there was a natural unprejudiced transition from the known language to the unknown language.

Eugenia Johnstone [1958] asserts that there is some evi-

dence that a child who learns to read and write in a foreign language first may suffer personality damage as a result because he has difficulty mastering the foreign vocabulary. The child who is faced with the task of expressing ideas in a foreign language at an age when his powers of self-expression even in his own language are but incompletely developed, may possibly never achieve adequate self-expression in either language.

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