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ABSTRACT

This conference report is centered on that phase of the Targeted Research and Development Program in Reading literature search dealing with language development as it relates to reading. Models of language acquisition, hypotheses derived from the models, and comparisons of synthesized models are discussed. Among them are behaviorist (Skinner), cognitive (Chomsky), and concept acquisition (Brown) models, and relationships are drawn both among the models and between them and the work of Piaget in developing an organismic-developmental model. The work of Lennebury and Carrol is also discussed at some length. Implications of each of these models for reading instruction are discussed. The behaviorist models suggest programed instruction beginning with simple units and proceeding to larger ones; the cognitive models suggest development of verbal abilities prior to reading instruction; and the developmental models suggest that learning during early school years might better employ methods other than those requiring abstract symbols. All of the models suggest the importance of classification abilities and acquaintance with the dialect of reading materials before instruction begins. References are included. (MS)

THEORIES OF LANGUAGE DEVELOPMENT AND THEIR RELATION TO READING[1,2]

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Introduction

The Literature Search in Reading[2] is the second of three projects comprising the Targeted Research and Development Program in Reading, which is a part of the U.S. Office of Education's Right to Read Effort. The Literature Search encompasses three areas: (1) Language development and its

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[2]For a more complete description of this project see Kling (11).

relation to reading; (2) the process of learning to read; and (3) the reading process. This paper will deal with the first of these areas.

The objectives of the project in terms of the language area are: (1) To identify all models[3] or partial models[4] which describe or purport to explain the behavioral events or operations involved in the process of acquiring language; (2) to ascertain the extent to which hypotheses, derived or derivable from the models have been tested; (3) to synthesize the models to produce, insofar as possible, the smallest number of logically coherent models, which will account for the maximum number of known facts (i.e., documented through research), and will show precisely where original or replicative studies are needed; and (4) to compare the synthesized model or models with models of the learning to read and the mature reading process in order to show how they may yield fresh insights into the latter processes. For the time being, work in the language area

[3]Gephart's (10, p. 38) definition has been used as a guideline in identifying models: A model is a representation of a phenomenon which displays the identifiable structural elements of that phenomenon, the relationships among those elements, and the processes involved in the natural phenomenon.

[4]Hereafter, the term "models" will include both comprehensive and partial models.

must proceed independently of the other two areas, with much closer coordination during the later stages of the project. To date then we have concentrated on two major tasks[5]: (1) To identify all contributions to the literature having to do with language, language development, and especially, language in relation to reading. This phase of our endeavor, which took place during the summer, yielded a total of over 1000 references; (2) to identify, describe, and categorize the principal models of language acquisition. The second section of the paper presents a brief description of the principal models. The final section attempts to assess some of the implications for reading, albeit tentatively, since the intermediate step of reviewing the research literature relevant to testing the model is logically prior.

Language Acquisition Models

The traditional ideological split between rationalism and empiricism, which originated in philosophy, found its way into psychology, and has reappeared in the guise of many different

[5]The author is indebted to Lynn Lesyk, who compiled a large number of the bibliographical references, and to Sandy Baer, Ann Capling, Mary Culkin, Bonnie Mardis, and Alice Salzberg, who identified the models, and reviewed some of the relevant research literature.

controversial issues, is also evident in the different approaches used to explain the phenomenon of language.[6] Psychology's coming-of-age came at a time when empiricism was beginning to gain ascendance. It was almost inevitable that the stimulus-response paradigm which, from its origin as a productive experimental method evolved into the basic explanatory principle for all behavior, should be applied to the interpretation of language.

Briefly, the operant conditioning model, as set forth by Skinner (19), and Mowrer (15), when invoked to explain language, relies heavily on the concepts of imitation and successive approximation by means of reinforcement in situations which pair the object or event with its symbolic referent.

This simplistic account first came under fire in Chomsky's review of Skinner's Verbal Behavior (7), in which he posed the basic question: If a child learns language only through the stimulus of hearing sentences spoken around him, and through rewards for correct imitation, how is it that he can speak a sentence he has never heard? Indeed, it seems impossible to construct a probabilistic model that produces all the sentences

[6]For a discussion of topical issues related to the rationalist-empiricist dichotomy, see the recent article by Tom Alexander (1).

of English. Chomsky's suggested answer is that every human child is born with some elaborate kind of language-generating capacity and propensity. His theory of syntax (8) describes language as genetically bound and transmitted through a kind of cultural memory in terms of a set of generative rewrite rules, for the construction of new sentences. 'ernel sentences are stored in memory with footnotes to transform the sentences in any way necessary. A sentence has both surface structure and deep structure, the latter consisting of the interpretations of the sentence assigned by transformational rules. Traditional grammars and probabilistic models of language have assumed that meaning is dependent on grammar. In Chomsky's model what is grammatical is independent of what is meaningful.

Chomsky's model has aroused much interest not only among cognitive theorists, but also among the behaviorists. Skinner (19) has retorted that the idea that a child constructs the grammar for himself is as misleading as saying that a dog which catches a ball has constructed the relevant part of the science of mechanics. Yet it is true that people do speak grammatically without being able to describe their grammar, and so, in some sense have implicit rules. Staats (21) has attempted to counter some of the linguists' criticisms, and to restate the case for behaviorism. Linguistic theory, according to his argument,

cannot make explanatory statements, since the linguist is concerned with describing language behavior, and has no contact with its determining conditions. A comprehensive theory of language must tell us how language functions to determine important aspects of human behavior. While linguistics has not concerned itself with these questions, Staats maintains that "integrated learning theory is fully capable of indicating in a credible and useful manner how language behaviors mediate such cognitive behaviors as reasoning, problem solving, intelligence, perception, and so on" (p. 158). The problem of original sentences can be answered in terms of new combinations of learned speech patterns. More recently, MacCorquodale (13, 14) has concluded that Chomsky's review "does not constitute a critical analysis of Skinner's Verbal Behavior (since) the theory criticized in the review was an amalgam of some rather outdated behavioristic lore, including... (several) notions which have nothing to do with Skinner's account" (p. 98).

Brown and Bellugi (4) recognize two processes of language acquisition: imitation and the induction of latent structures. Brown accepts Mowrer's imitation as an explanation of the emergence of correct pronunciation from random babbling. However, this concept is seen as inadequate to account for the child's later linguistic achievements. The child continues to imitate

his parents' sentences, but with many of the original words left out, producing what is known as "telegraphic" speech. The word order is preserved, but functional words such as articles, modals, auxiliaries, and inflections, are omitted, possibly due to the limited memory span of children.

After the child has made the reduction of adult speech, he apparently forms generalizations about the syntax or word order, which is preserved. Brown and Fraser (5, p. 45-47) have shown that even at the two- and three-word sentence level, children maintain a strict grammar, which later becomes more differentiated. That these are generative grammars is evident from systematic errors which are unlikely to be imitations of adult utterances. As Brown points out, the generalization of rules is a strong tendency in children. They frequently regularize irregular verbs (e.g. "digged") even though the irregular form is very common. Since rules are apparently more important than practice, it seems likely that children form syntactic rules from their imitation and reduction of adult speech and that these rules lead to the construction of new sentences.

At the same time as the child is learning the use of linguistic forms, pronunciation, and grammar, he is also learning about non-linguistic categories which correspond to names. Like Piaget, Brown believes that the child is learning, even before

he speaks or understands language, by handling objects and observing his surroundings. Thus he forms concepts of such universals as space, time, and physical objects. This learning continues throughout life, and is greatly affected by language. He learns to use his knowledge of the environment to form the categories which correspond to names. Unlike the pre-language universal concepts, these referent categories are cultural, since words have different ranges of reference in different languages.

Brown cites evidence that up to adolescence children learn classification in a different way from adults. Their notion of the relationship of subclasses to larger classes is imprecise. They classify in terms of "chain complexes" (i.e., to two objects which have a common characteristic is added a third object having a different characteristic in common with one of the first pair), rather than on the basis of a common denominator. Hence, although the formation of new reference categories goes on throughout the lifetime of the individual, it proceeds differently in childhood.

For Brown, then, the model of language development is intimately bound up with the process of concept acquisition, since the central function of language is to make reference between linguistic and non-linguistic categories. Piaget (16) likewise, recognizes that any description of the child's language

must ultimately be a part of the larger model of the child's developing cognitive organization. The character of language changes as the child's development moves from the sensorimotor to the preoperational and operational stages of thought. The sensorimotor period, is characterized by concrete actions in which the child learns about his world by interacting with it in terms of sensory and motor activity. Although language is not a primary characteristic at this time, clearly this stage lays the foundation for both language and thought. In the preoperational stage, egocentric speech constitutes almost half of the child's language. The child's use of symbols frees him from dependence on immediate concrete objects, but the symbols are mobile and personal. However, the use of symbols is the first step in the development of representative thought. Socialized speech, which characterizes the operational stages, Piaget sometimes refers to as communicable intelligence, since it reflects the ability to adapt information to the listener's point of view. As the child discovers the need to defend his actions and ideas to himself and others he adapts and organizes his thought and speech to this end. Through repeated attempts to establish new levels of equilibrium, the child develops toward more sophisticated levels of logical, analytical thought characterized by the use of signs which, unlike the earlier

symbol, have relatively fixed, interpersonal meaning. For Piaget, language is the vehicle which, through its interplay with the earliest forms of thought, enables the child to conceptualize the world around him, thus arriving at higher forms of representative thought.

Piaget's description of the growth of language may be described as an organismic-developmental model. It has certain features in common with those of Lenneberg (12) and of Werner and Kaplan (22). Lenneberg's model has evolved through cross-cultural research and through clinical studies of the effects of retardation, psychosis, and trauma on normal growth.

The organismic-developmental models are based on the conviction that language acquisition has a biological basis. The limits within which the form of any language can be structured, and the sequence in which aspects of language are acquired are determined by genetic factors, as are the child's potential and state of readiness for language acquisition. Language is the result of species-specific cognitive abilities. The cognitive function is basic, language being more dependent on cognition than vice versa.[7] Maturation of cognitive processes comes about through progressive differentiation of experience, a traversing of highly unstable states whose disequilibrium leads to

[7]Much of the recent work toward "visual literacy" supports this assumption.

rearrangements of the elements of thought, adult thought being characterized by relatively stable arrangements.

Lenneberg cites evidence that acquisition of language follows certain developmental stages, which emerge as the result of the interaction of maturation with preprogrammed learning.

> The first feature of natural language to be discernible in a child's babbling is contour of intonation .... The linguistic development of utterance does not seem to begin by a composition of individual, independently movable items, but as a whole tonal pattern ... The acoustic shape is only a crude replica of the adult word, and it is only by means of our capacity to see pattern similarities that we can recognize the child's word. This is common enough knowledge. But perhaps it has not been sufficiently stressed that it is not merely the adult who must be able to equate the child's utterance to an English word; the child himself must have similar skills in pattern recognition and equation. For almost a year children are satisfied with general pattern similarity and dispense, so to speak, with segment by segment phonetic identity. Surely this has to do with their initial circumstances, and thus with maturational factors ... the infant's initial lack of concern for phonetic accuracy is by no means a trivial or logically necessary phenomenon. It points to a fundamental principle in language acquisition; what is acquired are patterns and structure, not constituent elements.
>
> (2, p. 226-227)

For Lenneberg, the sentence is the unit of discourse, and the one-or-two-word sentences, which are not only the first manifestations of child speech, but also occur in adult speech, are simply elliptical sentences whose meaning is uninterpretable unless the social context provides enough clues to reconstruct

a sentence from those words, e.g. when the child utters the word "Daddy", this isolated word may carry the meaning "Daddy is coming" or "Daddy, pick me up", depending on the intonation and accompanying gestures. Thus, our ability to understand many utterances which are not grammatically correct depends on the degree to which they conform to a limited set of admissible rules. The paradox is this: If the child's task is to abstract principles that generate correct sentences, but he is presented indiscriminately with semi- and proper- sentences, how can the correct principles be established? The answer seems to be that they come to be established by virtue of the child's developing ability to categorize. Syntactic categorization is the speaker's act of superimposing structure; he assigns given lexical items to parts of speech. The child's syntax is primitive because all of his words have the same syntactic function. Any word whether verb, noun, or adjective may stand for a complete sentence. With the advent of two-word sentences, however, there is the suggestion of a primitive subject-predicate distinction, since one of the words often functions as a pivot word. Longer sentences may be seen to consist of the pivot word plus elaborations on the second word in the form of modifiers.

Lenneberg concludes that:

> We are discovering a basic process that is reflected in language as well as in many other aspects of behavior. It consists of first grasping a whole that is subsequently further differentiated, each of the specifics arriving at a different time and being subordinated to the whole by a process of temporal integration. In productive behavior a plan for the whole is differentiated into components, and the temporal integration results in ordering of movements (or thoughts). Organization of phrase structure with the resulting phenomenon of recursiveness and nested dependencies appears as a "natural phenomenon" once we assume that a ubiquitous process is influencing a specific behavior.
>
> (2, p. 236)

A descriptive model of language acquisition, if it is to be adequate, cannot avoid examining the relationship between language and thought. In his book Language and Thought, Carroll (6) accepts Piaget's definition of a concept as "an internal representation of a certain class of experiences" which may be attained without the use of language. A child may, of course, use a label inappropriately, but once he is able to use a word to refer to the same class of experiences as do the members of his speech community, he may be said to have acquired the concept. One function of linguistic forms is to alert the listener to the existence of a possible class of experiences, but "a label is not particularly useful when it does not readily refer to a well-learned class of experiences" (6, p. 97). Most languages, whether natural or artificial, provide sufficient words to catalog or describe nearly all of the experiences that occur to users of the language.

Carroll finds that, while vocabularies differ in size depending on the state of advancement of the civilization, the "core vocabularies" of all languages are roughly of the same order of magnitude, around 10,000 words, reflecting certain uniformities of the physical and biological environment of mankind. Having names for things does not seem to increase the capacity for discrimination, but it does seem to enhance the ability to recognize and identify particular discriminations from memory. The existence of different words for different categories draws attention to those categories, thus making the differences between stimuli more salient or noticeable.

It is at the stage of grammatical construction that language structure begins to aid in thinking, beyond what could happen without language. Carroll uses the term "reasoning" to describe thinking aided by language, and maintains that the ability to reason depends largely on the ability to formulate steps in an inferential process in terms of language.

Carroll summarizes the relationship between language and thought in these words:

> Human beings, from an early age, develop internal processes that represent sensations and perceptions in such a way that they can be stored in memory, and later brought back into consciousness and manipulated in the absence of the stimuli that originally evoked them. The language of a given social environment exhibits a relationship to the internal processes of

> the language users in their transactions with their environment. As the child assimilates the structure of his language, his internal processes become more and more like those of the speech community, insofar as these processes are represented by language. Thinking is the conscious or unconscious manipulation of internal processes usually toward the solution of some problem, while communication seeks to arouse certain internal processes in the hearer. Language thus figures prominently in thinking. The concepts named by language symbols are tools of thought in that they are mediating responses which bridge the stimulus-response gap and represent organizations of internal processes acquired through past experience.
>
> (3, p. 110)

These concepts are coded linguistically and are important in the solution of problems. In fact, the individual's repertoire of concepts and his skills in manipulating them will determine in large measure his facility in coping with the problems of his environment.

A brief exposition of some of the major models of language acquisition has been presented here, but there are many other less comprehensive models which may have implications for reading and will be considered in the course of this year-long investigation. No attempt has been made to present models of the reading process such as those of Goodman, Ruddell, Singer, Venezky and Calfee, etc. (18), but a later phase will need to study points of comparison and possible integration of these with models of language acquisition.

Implications for Reading

It may well be premature to attempt to extract implications for reading from the language models described, prior to an examination of the extent to which each model is supported by experimental evidence. It is tempting, however, to consider a few implications which seem to follow readily from the models, taken separately or together.

1. Operant conditioning models have traditionally been weakest in specifying amount, timing, and kind of reinforcement appropriate to learning particular tasks. Skinner's latest book (16) does specify contingencies of reinforcement, but makes little reference to language behavior as such. The concept of programmed learning which follows from this model would suggest that reading instruction start with simple units such as letters or words before proceeding to larger units such as sentences.

2. Cognitive models usually propose a biological basis to account for the developmental order of appearance of language. One observable aspect of the development of linguistic forms is that the child's comprehension of linguistic form precedes and exceeds his production of these forms (Chomsky's competence-performance distinction). This suggests that non-verbal children need help in verbalizing their understandings, i.e. in assigning "constituent structures", in Miller's [8] term, to their utterances. For example, the constituent structure of an ambiguous sentence may become apparent only through questions. The teacher can help the child to clarify his understanding and speech by asking, and by encouraging the child to ask himself, appropriate questions. In effect, this is the kind of tacit questioning which occurs in that "psycholinguistic guessing game" we call reading (Goodman, 18, p. 259).

[8] Miller cites the ambiguous sentence "They are eating apples," the meaning of which be omes apparent only when one knows which of the two questions it answers: "What are they eating? or "What kind of apples are they?"

3. All theorists are convinced of the close relationship between language and thought, whether thought is defined in terms of mediating responses, discriminations, internal schemas, etc. Since most theorists agree that some classification can precede language, children can be helped even from infancy to pay attention to discriminating features of the environment, and to classify stimuli in ways appropriate to their speech community.

4. It seems necessary, if the child is to learn to read standard English, that he be exposed to, and interact with, adults and children who use standard English. If the home uses a foreign language or dialect, the young child learns which set of language behaviors is appropriate to which situation. Lenneberg's work would suggest that these models are particularly crucial during the age range 2 to 4 years, the period of greatest activity in language development.

5. Piaget's theory suggests that abstract symbols are meaningless to children unless they have an experiential background which, as Brown would say, links the symbols to their nonreferent objects. Elkind (9) has hypothesized that the child is not ready to read until his perception is decentered and his thought is operational. Until the child can grasp the essential phoneme-grapheme relationship, any appearance of reading is rote verbalization. Again this suggests that maturation is an important factor in reading, but that maturation is triggered by the experiences necessary for the child to establish concepts which are more than empty verbalizations. One may ask why reading should be taught at an age when the best learning comes through experience not through abstract symbols.

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