R E P O R T R E S U M E S

ED 012 678 RE 000 164

THE MODALITY CONCEPT--INCLUDING A STATEMENT OF THE PERCEPTUAL AND CONCEPTUAL LEVELS OF LEARNING.

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PUB DATE MAY 67

EDRS PRICE MF-$0.25 HC-$0.80 20P.

DESCRIPTORS- *PERCEPTUALLY HANDICAPPED, *VISUALLY HANDICAPPED, *AURALLY HANDICAPPED, *CONCEPTUAL SCHEMES, UNDERACHIEVERS, READING PROCESSES, MODELS, PERCEPTUAL DEVELOPMENT, READING DIFFICULTY, LEARNING PROCESSES, *LEARNING THEORIES, INTERNATIONAL READING ASSOCIATION, WEPMAN AUDITORY DISCRIMINATION TEST, SEATTLE

THE DIFFERENCES AMONG CHILDREN IN THEIR USE OF SPECIFIC MODALITIES FOR LEARNING AND THE NECESSARY ESTABLISHMENT OF PERCEPTUAL BASES FOR CONCEPTUAL LEARNING ARE DISCUSSED. A MODEL IS PRESENTED WHICH EMPHASIZES THE MODALITY-BOUND NATURE OF INPUT AND OUTPUT, AND ELABORATES THE HIERARCHIAL BUT INTERRELATED NATURE OF THE MATURATION AND DEVELOPMENT OF THE NEURAL SYSTEM. THE IMPORTANCE OF THE DISTINCTION OF MODALITY LEARNING LIES IN THE DIRECTION FOR ASSISTING UNDERACHIEVERS. THE EFFECT UPON READING ACHIEVEMENT IS DISCUSSED. REFERENCES ARE INCLUDED. THIS PAPER WAS PREPARED FOR PRESENTATION AT THE INTERNATIONAL READING ASSOCIATION ANNUAL CONVENTION (12TH, SEATTLE, MAY 4-6, 1967). (BK)

The Modality Concept -- Including a Statement of the Perceptual and Conceptual Levels of Learning

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1967

" The intellectual life of man consists almost wholly in his substitution of a conceptual order for the perceptual order in which his experience originally comes. "

William James
Essays on Radical Empiricism

For presentation at:

The International Reading Association

12th Annual Convention

Seattle, Washington

May 4, 5, and 6, 1967

In a recent news-letter from a suburban Chicago special education group, the lead article dealt with learning disabilities and mental retardation. A plea was made that the schools recognize that "maturational lags or temporarily arrested development not be confused with low potential." The article continued with the statement that "... of every thousand American school age children, 150 will have learning problems, 30 will be mentally retarded, and 5 will have learning disabilities and mental retardation." (1) Whether the incidence figures quoted are correct or not, we are all concerned about such children, especially those with normal intellectual potential who are underachievers.

Learning theories and learning theorists, whether biologically or environmentally oriented, have most often failed in their treatment of this issue. They have described the learning process as they see it, but have failed to describe the child who must do the learning. They have rarely provided us with data on the evolution of individual differences in learning abilities of children. Literally, they have never given us reasons why, according to their theories, the underachiever underachieves.

The present paper is an attempt to rectify, at least in part, this neglect of a crucial aspect of learning. While it is not the statement of yet another learning theory, it does

provide a modus operandi for learning, e.g., how it is achieved, and therefore, why some children do not achieve when it seems as though they should. It also serves as a partial explanation of individual differences in the manner of learning. Through the approach advocated, it is hoped we can gain some greater insights into the problems of the 15% of all school children who are said to be underachieving.

The present paper deals with the initial stages of learning, especially the early steps taken by children as they develop the capacity to utilize their maturing neurological system. It is not intended as a criticism nor as a support of any of the well publicized theories of learning. It is in fact compatible with any or all of them.

The hypothetical model presented as Figure 1. stresses two features of the structural base underlying the learning act. First, it emphasizes the unique modality bound nature of all sensory input signals and all motor output patterns. Second, it elaborates the hierarchical yet interrelated nature of the maturation and development of the neural system. In this regard it parallels what is known of the physiological maturation of the central nervous system. *

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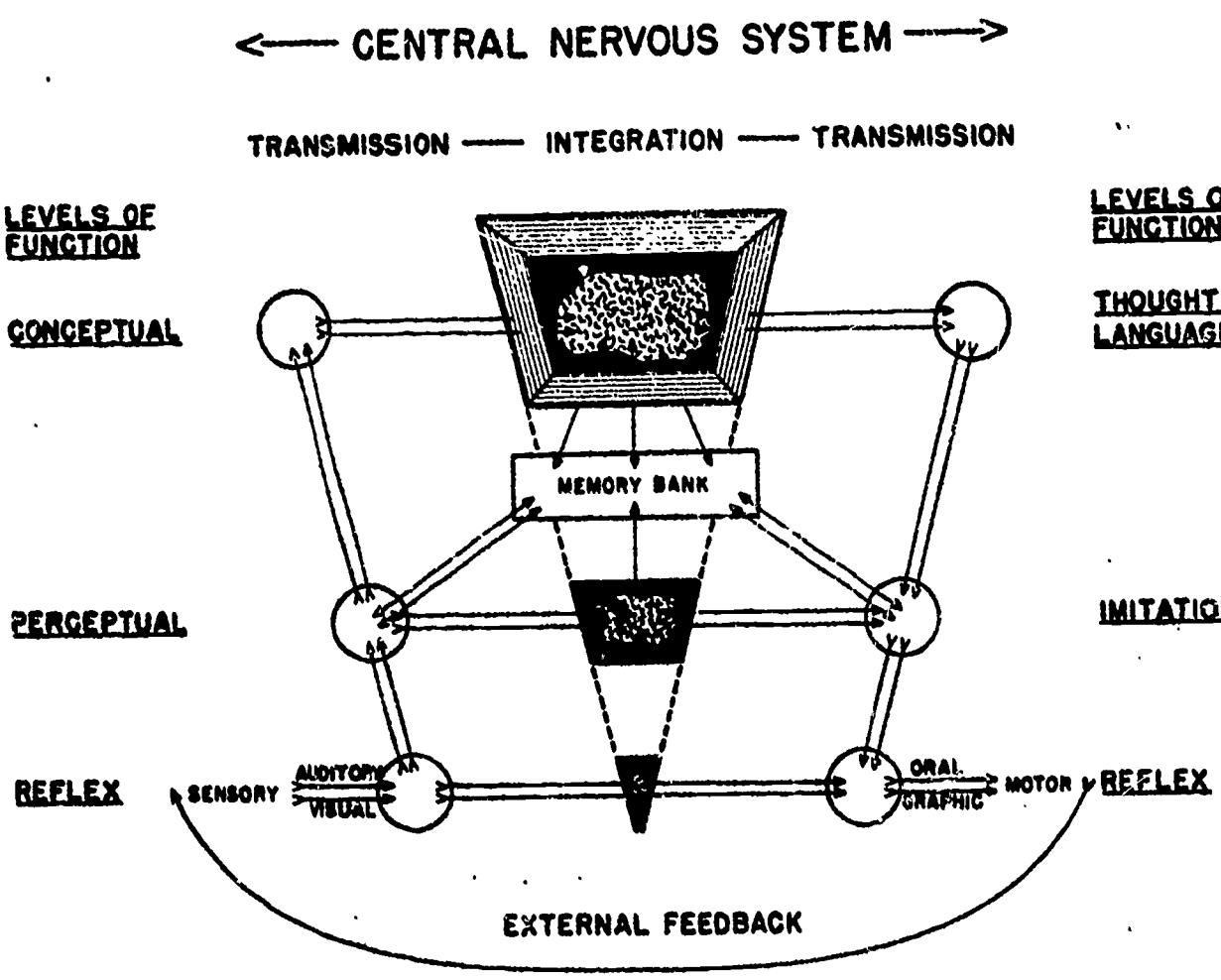
* In the present context, the word 'maturation' is used to describe the establishment of the neurological components necessary for sensory transmission , integration and motor transmission of signals within the nervous system. The term 'development' is reserved for the functional adaptation of an established neural pathway.

Figure 1.



AN OPERATIONAL DIAGRAM OF THE LEVELS OF FUNCTION IN THE CNS

Figure 1. is designed to illustrate both the modality bound nature of the input and output signals and the increasing levels of complexity of function as the individual matures. The modality bound nature of children's learning behavior was initially recognized in the clinically observed fact that many children with learning problems appeared to have greater facility using one input pathway than another and -- an observation of equal importance -- they had considerably less facility along other pathways. This was seen most easily in children with known impairments of neurological structure such as localized brain tumors or accidents affecting, for example, the transmission of auditory signals, but not visual or tactual signals. Similar behavior, however, was seen in some children who had no demonstrable neurological impairment. The learning behavior of this group of children was so similar to the earlier group that even today they are sometimes, erroneously I believe, said to have 'minimal brain impairment'. As more children were studied from this modality viewpoint, it was apparent that a predilection for one sensory input channel over the others could be observed, regardless of whether a suspicion of organic impairment or pathology was present. This seemed in keeping with the concept first suggested by Charcot as reported by Freud (2) that each person has a particular modality of choice in learning, a typology of 'audile', visile', and 'tactile' learners.

Phenomenological data for the division of people into learning types seems to abound in life around us. Toscanini is said to have heard every note of music he read. Picasso, on the other hand, is said to see in his own unique way, even the sounds of animals in the field. People select occupations based upon their predilection for auditory stimuli (musicians) while others pursue the grapic arts (painting) because of their visile-ness.

Clinical data from the handicapped learner or under-achiever is equally omnipresent, if one is alerted to it. Some children have been known to be so deficient in auditory processing of signals that for most environmental situations they are functionally deaf even though their hearing acuity is quite normal. One such child was incapable of recalling a telephone number or a single item from a list of ten items read to him. Another could not distinguish the letters of the alphabet at twelve years of age, yet suffered no loss of visual acuity. Studies of adult brain-injured subjects showed with clarity residual ability that was modality bound as they processed verbal stimuli. A factor analytic study of the responses of 168 adult aphasic patients to visual and auditory stimuli on the Language Modalities Test for Aphasia showed "... for all analyses (a single factor) was best defined by all items demanding oral response to visual stimuli, ... while the oral response to auditory stimuli appeared as a separate factor." (3). Still further evidence has been collected from the

behavior of a variety of populations which will be reported in some detail during the course of the day's program.

It should be sufficient to say at this time that the concept of differential use of the separate input pathways is no longer purely theoretical but is assuming the proportions of an acceptable fact about children and their learning.

The differential modality distinction appears to be related more closely to the innate capacity of a child than to any determinable environmental factor. No specific deprivation of stimulation could be found in the home or play environments of children with poor auditory learning, poor visual or poor tactile-kinesthetic learning. In fact, within the populations studied clinically, such children have been found to come from all types of homes, including the highly verbal university setting as well as the almost non-verbal disadvantaged environments. They came from homes where they were the only child, and from homes where they were the eldest or youngest of multiple sibling groups.

For most children, the two major modalities seemed to reach a stage of equalization of function by the time they reached their ninth birthday, e.g., whatever lags in development were present seemed to be overcome by that time. Usually, however, the modality showing the most rapid development indicated the child's predilection. Perhaps from this

it might be said that a modality matures due to some innate neurological tendency -- for the audile child, the auditory pathway matures soonest; for the visile child, the visual pathway. With maturation, there is an accompanying developmental sequence -- again, the earliest to mature nominates the earlier development of function. The audile child, then, not only matures earliest in an auditory sense, but develops his more mature pathway with the greater ease. Here, use of the pathway assists with its development It comes to complete function and use at an early age. Practically, this would mean that both perceptual and conceptual function would develop early with consequent early and accurate acquisition and use of speech. The visual function of such an 'audile' child could be either rapid or slow in its development. If it is rapid, reading would be accomplished easily, but if it is slow, reading might be delayed somewhat, by the need for compensation to assist the auditory pathway. If the visual were very slow indeed, then reading might present a real block since only the auditory percepts would be available and, while reading is more than a visual skill, it does require vision.

The visile child would pose quite a different problem. If he is average in auditory learning, his reading might be slightly affected in the early school years. If, however, he

is markedly slow in auditory perceptual development, only high intelligence providing almost automatic compensation would be helpful, or the services of an alert and patient therapist.

To understand the effect of modality preference on such skills as reading, speech, spelling, et cetera, one must not only be able to isolate the preferred modality, but be able to assess the level of achievement and the potential for training of whatever modality is delayed in its development.

While the emphasis here has been upon the development of visual and auditory pathways, the visuo-motor and moto-kinesthetic pathways need equal attention. In some ways they are perhaps the better attested of the developmentally related modality functions, as Frostig (4) and others have demonstrated.

Attempts to reduce the effect of a lag in developmental progression in any one of the modalities has been somewhat equivocal. Auditory training for children with slow development of such processes as discrimination, memory and sequencing along that modality has produced good results in some children, and failed to produce results in others. These are clinical data, however, and should be studied under the more rigorous analyses of research. For what it is worth, however,

those children with poor auditory discrimination who showed what was believed to be causally related speech articulatory inaccuracy failed to improve in auditory discrimination with directed training. On the other hand, children with inadequate auditory discrimination who had difficulty learning to read, again with supposed causal relationships, did indeed improve in discrimination with training.

The major importance of the modality distinction, lies in the direction that it may give for assisting the underachiever. Too often the remedial reading teacher follows the same pattern in remedial work that the classroom teacher follows in general instruction. We have long assumed that a particular method or pattern for teaching or remediating the art or skill of reading was appropriate -- whatever that method might be. The concept of differential modality proclivity would argue for tailoring the instruction and the remediation, especially the latter, to the capacity of the individual child. To illustrate the problems that arise when this is not done: consider the child who has an inadequate auditory perceptual ability as demonstrated by his incapacity to differentiate the sounds of the language, retain and recall them, sequence them properly, or associate them with previously learned visual or tactual-kinesthetic clues, when he is faced by an instructional or remedial program based on the learning of phonics. Consider, oppositely, the child who demonstrates a slower progression of his visual skills

than is expected of him, who is faced by a school system approach that fosters sight training. In either instance the failure to recognize the differential modality distinctions for these children almost fore-dooms them to failure in achievement of reading. While this may affect in a major sense only a minimum of the children who are underachievers, it may be partially at the base of a wide variety of other problems engendered by the original failure. Perhaps the entire thesis of the argument for considering the modality distinction can be most succinctly stated as providing a way of understanding the underachiever. If indeed he can be seen as a child who is underachieving because of some real modality distinction, then programs can, and I believe will, be developed that will be of assistance to him.

To this date, attempts to predict reading problems from results on prior perceptual testing has been less than rewarding. While it is true that a greater number of children with poor reading achievement showed poor visual discrimination and memory as well as poor auditory discrimination and memory, the number of false positives has made the prediction an unlikely one. However, at the time when poor reading achievement can be identified, the presence of poor visual or auditory perception can point the way to directed remediation.

The second important aspect of the model presented as Figure 1. is the time-bound progression of the neural system building each succeeding layer upon previously developed layers both in the sense of maturation and development. The infant begins life with a mature and well developed reflex system which soon differentiates into a bridge permitting the flow of environmentally induced signals which proceed from input through integration to output. At this stage, psychologically, only recognition is achieved, but not comprehension. At this level of behavior, the child learns to imitate and echo his environment. He learns to discriminate the sounds of the language he hears and later to differentiate the letters and other forms that he sees. Finally, he develops his highest level of neural behavior -- he receives, integrates and expresses signals from a variety of modalities with comprehension of the input, synthesizes and associates the interpreted signal with previous learning, and formulates an output signal with intent to communicate.

Two kinds of learning, then, are evident -- the perceptual, pre-linguistic pre-operational learning described most completely by Piaget and his followers as 'sensory-motor learning', and the more complex, conceptualizing type of learning with comprehension and intent. Attention in this paper is directed to the former, not because it is felt that this is the more important of the two, but because it seems that there has been

overemphasis on the latter for beginning learners of any new skill. This overemphasis has led to a tendency to focus on the child's attack on new learning at the conceptual level, frequently before the child has established a proper perceptual base for that learning. Werner and Kaplan (6) in their study of symbol formation, pointed out that "...a fuller psychological insight into all representation, including linguistic, will be obtained only by operating on the assumption that linguistic representation emerges from and is rooted in non-linguistic forms of representation."

The child having difficulty learning to read, it is here argued, may well be started at too high a level for him if comprehension is demanded before he has mastered the pre-verbal perceptual distinctions necessary for phonic interpolations. The development of the maturing perceptual level can be seen in the progressive achievement of such skills as discrimination, retention and recall of sounds and letters, sequential ordering of phonemes and graphemes, and the ability to interrelated one with the other.

To illustrate what it is the child must learn and be able to use at this pre-comprehension level of behavior, let us explore in some detail the act of auditory discrimination. This auditory perceptual function is the ability to differentiate each sound of the language from every other sound of the language;

at its grossest level, for example, the ability to separate vowels from consonants, then vowels from other vowels, and finally, consonants from other consonants. Vowel discriminations are, for the most part, well accomplished by all but a handful of children by the end of the third year, yet all of us experience some difficulty discriminating certain vowels from others, when spoken -- did he say /pen/ or /pin/ ? is a common adult question, when the context does not provide a satisfactory clue. The difference between the /e/ and /i/ when used medially in a single syllable word is a minimal contrast of considerable difficulty. The distinctions between some consonants is equally difficult -- /p/ and /b/ for example cannot be considered as within the differential speaking armamentarium of the child until he can listen to word pairs like /pat/ and /bat/, and /pin/ and /bin/, and recognize them as being different. The linguistic term for this recognition of difference is called the method of "minimal contrasts" (7). A growing body of research now points to the fact that this ability to form minimal contrasts is a developing process that goes on quite normally in children through their eighth year of life. Some children develop the ability early in life -- their speech efforts reflect this early development. They speak accurately almost from the onset. They have the 'ear' to guide their speech attempts. Other children, however, develop this discriminatory ability more slowly and their speech accuracy often

mirrors their development. Some children have difficulty with auditory discrimination throughout their lives, and learn to speak with accuracy only by compensatory means.

Turning back to what has been said about Charcot's concept of learning typology mentioned earlier, the child with good intelligence but slow in development of auditory discrimination ability would undoubtedly need to be thought of as a 'visile' child, or perhaps 'tactile' in his learning, while the child who speaks early and accurately, but later shows some difficulty acquiring the distinctions necessary for differentiating visual forms would most probably be 'audile' or 'tactile'. Some children, of course, will be found who are slow at developing any of their perceptual skills, regardless of the modality involved. These would need to be classified as mentally retarded since they would have no avenue open to them for learning -- and after all, that is what we mean by mental retardation -- the inability to learn.

Stress needs to be placed in initial stages of learning, on this perceptual level, or the later learning at the conceptual level may be faulty and without a basic structure upon which the child can develop his linguistic skills. Where a lag in the developmental process along any of the modalities can be determined, the remedial task seems most properly directed at that modality -- yet if success cannot be achieved through such a

direct approach, the teacher should not hesitate to turn to the other modalities, since reading - like speech or writing or spelling - cannot be considered the product of any single modality but rather a confluence of them all. It is believed that this generalized attack through parallel alphabets is the source of the success achieved with such teaching approaches as the Initial Teaching Alphabet (8) which takes advantage of a common alphabet of sounds and letters. Similarly, the Illinois Test of Psycholinguistic Abilities (9) develops with considerable acumen the modality differential in language acquisition, especially at the conceptual level.

No brief is held here for or against any specific teaching method. It is believed that any method can be adapted to the purposes of modality distinctions or reduced to the level of perceptual function, if that is needed. Every teacher and therapist whose unlikely task it is to make every child literate must, at this time at least, be ingenious enough to provide the materials necessary for such teaching. Unless my estimate of the commercial adjuncts to reading is in error, however, and unless the proposed approach to underachievement turns out to be totally unsuccessful, materials will be produced in great abundance.

The paper stresses two factors -- the difference among children in their use of specific modalities for learning, and the necessary establishment of perceptual bases for conceptual learning. It is hoped that at least for the child in need of

remediation, education can take on the nature of a child-centered program, and shift away from our ready acceptance of automatization and conformity. While we speak of education in the mass sense, it is the individual child who must learn. It is for his good that the ideas here proposed have been formulated.

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