1-1-1971

The development of perception.

Donald T. Streets
University of Massachusetts Amherst

THE DEVELOPMENT OF PERCEPTION

A Dissertation in Compensatory
Education for Partial Fulfillment
of the Requirements for an Ed. D.
Degree

Submitted by

Donald Streets
University of Massachusetts
Amherst, Massachusetts

May, 1971

Dissertation: THE DEVELOPMENT OF PERCEPTION

Doctoral Student: Donald T. Streets

This is to certify that the above dissertation has been approved in form and content by:

Dissertation Committee:

______________________________ - chairman

____

____

____

____

____

Dean

TABLE OF CONTENTS

Chapter | Page

CHAPTER ONE

INTRODUCTION

A. Compensatory Education

Due to the availability of federal funds, compensatory education today represents the basic response of school systems throughout the country to national concern for the plight of the culturally disadvantaged child. The typical program represents an expanded and more intensive dosage of traditional remediation and cultural enrichment activities replicating those pedagogical practices and materials which had failed to produce even minimal results in the past. It is rather ironic that the traditional approach currently being indicted by many as inherently defective, particularly with regard to meeting the differential needs of a highly diversified student population (whose varying needs derive from intellectual, social, cultural, learning, linguistic and ethnic differences) should be thought of and adopted as the panacea to compensate for the very learning shortage and malfunctioning it helped to create.

Traditional education has been effective primarily with those students whose orientation is basically middle-class and who have experienced five years of pre-school instruction in the form of the "hidden curriculum" (hidden curriculum refers to the learning experience which seems to be characteristic of middle-class homes) of the middle-class family.

Conversely those who do not come from a middle-class experience find the traditional program inappropriate in terms of the reception awaiting them, the quality and style of language of the teacher, the value system upon which the program is based, and the set of assumptions regarding both their language sophistication and repertoire of social experiences which determine the meaningfulness of subsequent school experiences.

All of these prerequisite areas of experience are not provided by the typical traditional school program. Thus, the culturally different youngster is very likely to begin school at a position of disadvantage characterized by an unrelatedness of condition which grows more severe as he moves through the various stages of educational exposure.

A rather graphic illustration of this type of situation is found in a longitudinal study of Head Start researched by Dr. Marvin Cline currently of Boston University. Dr. Cline found that by dropping the bottom 6% of black youngsters using intelligence test data as a criterion, the remaining 94% were intellectually comparable to white Head Start children as measured by the Stanford Binet. However, as both groups progressed through the primary grades there developed an ever increasing disparity between them in both measured intelligence and achievement, with black youngsters coming out less favorably. With out-of-school environmental influences being relatively equally unstimulating for both "disadvantaged" groups, the greatest single educational influence in the lives of those youngsters necessarily has been the formal instruction they have received in public schools. Therefore, the only feasible conclusion as to the cause of the growing disparity in performance is that the schools contribute significantly to it because they were either unprepared or unwilling to deal with the differential needs of youngsters along the dimension of race.[1]

Race is but one of many issues youngsters cannot escape within the public school setting. Among the great number of needs which all youngsters have there is a central need which holds a superordinate position. That need is training in how to become a competent learner. This critical need seems to have escaped the attention and concern of educators. There is abundant evidence which clearly demonstrates that how to learn itself is a learned process.

> An ineffective learner is one whose accumulated learning precludes, inhibits, slows up or places limitations on the rate and scope of present and future learning. The important point here is this: that disadvantaged students simply given information in subject matter areas (math, science, biology, etc.) as remedial work and perhaps a variety of cultural enrichment experience to supplement it, but no information and experience that will enable them to master the learning process itself--such students have no hope of "catching up" and staying "caught up."[2]

---

[1]Dr. Marvin Cline, Boston University. Private interview held at Boston University, April 4, 1969.

[2]Daniel Jordan, Blueprint for Action: A Summary of Recommendations for Improving Compensatory Education in Massachusetts (Amherst, 1970), p. 56.

B. Critical Variables of Learning Competency

The variables for becoming a competent learner basically reside in four interrelated behavioral domains: motor, perceptual, cognitive, and affective. The health benefit that derives from motor development has already been well established.[3] Furthermore, the need for motor ability seems apparent as a facilitator of classroom skills such as writing, reading, and general physical mobility. The relationship of motor development to the cognitive process of learning still remains inadequately defined and validated. However, more recent research of persons such as Newell C. Kephart, George H. Early, Marianne Frostig, to mention but a few, has revealed positive implications for the relationship between motor development as a basis for the emergence of perception and as an important facilitator of perceptual development.[4] Their concern is worth investigating both in terms of knowing how perception is neurologically possible, and also how the physical vehicle of perception might be strengthened in normal youngsters and those who have neurological impairment.

It has already been clearly established that disadvantaged youngsters rate lower in both perceptual and cognitive

---

[3]E. Benton Salt, Grace I. Fox and B. K. Stevens, Teaching Physical Education in the Elementary School, (New York, 1960) p. 8.

[4]George H. Earley, Perceptual Training in the Curriculum, (Columbus, 1969).

areas--they see and understand less more slowly.[5] Concerning the area of perception where the power or capacity to discriminate among visual and auditory stimuli is involved, disadvantaged youngsters show a paucity of the precise language characteristic of middle-class children.[6]

Deutsch paraphrases von Senden by stating that "people deprived of visual form experience for varying periods of time will show varying degrees of impairment in form discrimination."[7] Disadvantaged homes are conspicuously sparse not only in visual form experiences, but also equally limited in terms of the degree to which parents engage in the type of communication which helps children to label and define those forms precisely and unambiguously. Verbal impoverishment at this basic level implies the complete absence of more sophisticated language experiences which are prevalent in middle-class homes.

Regarding the auditory mode of perceptual development, tests reveal that disadvantaged youngsters are predisposed

---

[5]Daniel C. Jordon, Compensatory Education in Massachusetts: an Evaluation with Recommendations (Amherst, 1970), p.88

[6]Basil Bernstein, "Social Class and Linguistic Development: A Theory of Social Learning," in Education, Economy, and Society, edited by A.H. Halsey, et. al., Glenco, Illinois: Free Press, 1961.

[7]Cynthia Deutsch, "Learning in the Disadvantaged," The Disadvantaged Child (New York, 1967), p. 153.

to tuning out auditory stimuli perhaps because of the noisy background and weak signal conditions under which they live. Further studies reveal that these children tend to not hear (or screen out) the final phoneme, which in English has implications for grammar and syntax--critical determinants of conceptual behavior.[8]

Perception cannot be adequately investigated without looking into the part played by attending and motivational behavior, particularly as they relate to the whole process of selectivity--sorting out relevant stimuli among the vast array present in the environment. The role played by memory and previous perceptual behavior are also important, particularly as they relate to the formation of sets which form types of defining matrices which channel or screen relevant stimuli.

A rather extensive language study done by the Institute for Developmental Studies describes other differences characteristic of the poor learner. This study as well as data reported by Bernstein and other from Jensen reveal that the language of disadvantaged children is not only less rich in descriptive terms and modifiers, but also simpler in syntax. Vera P. Johns and Leo S. Goldstein hypothesize that the rate and breadth from labeling specific referents determine the ability to use words for signifying categories of objects,

---

[8]Ibid.

actions, or attributes, the mediation process which makes possible conceptual behavior.[9] To attempt higher levels of conceptual behavior such as categorizing, utilizing categories, symbolic transfer, analyzing and synthesizing data, speculation, forming and testing hypotheses, and seeing how learning one body of knowledge relates to learning others are all impossible unless one's perceptual acuity is well developed and the other stages of less complex conceptual behavior have been learned.[10]

The role of affect is less developed theoretically than the cognitive domain, and for that reason bears extensive and diligent research. What is apparent, though the research is sketchy, is that affect pervades all other domains of learning competency. And it has been hypothesized that the components of this area involve: (1) bringing one's feelings under rational control; (2) formulating a value system which supports actions that foster growth--curiosity and courage; and (3) develops commitments which give consistency and efficiency to patterns of development and growth.[11]

---

[9]Ibid.

[10]The writer is aware that there is data by linguists who "contend that black children have cognitive and linguistic skills which are structurally as coherent and complex as those of children of middle-class whites," see p. 14 of Social Aspects of Intelligence: Evidence and Issues by J. McV. Hunt and Girvin E. Kirk, U. of Illinois, May, 1970.

[11]Ibid., pp. 58-59.

C. Statement of the Problem

This dissertation addresses itself to an educational problem pertaining to the perceptual domain and will be devoted to the development of the specifications of a model program designed to provide the experiences needed to bring auditory and visual perceptual acuity to normal levels in individuals at different ages and at different periods of development in a broad and comprehensive way.

We are becoming increasingly aware that environmental influences play a large part in determining how fast and the extent to which a youngster learns. The physical, social, and ideational environmental influences serve as partners to the biological and psychological innate processes which shape the individual's personality development.[12] There is also considerable evidence accumulating which indicates that there are critical periods during which one is most receptive in developing certain perceptual and cognitive skills, and that if this period is passed, the organism finds it increasingly more difficult if not impossible to make up the lost opportunity.[13-14] These and many other similar studies provide substantial support for the assumption underlying the proposed

---

[12] Henry W. Maier, Three Theories of Child Development (New York, 1965), p. 26.

[13] Erik Erikson and Joan Erikson, "The Power of the New Born," Mademoselle, June, 1953, p. 62.

[14] H. F. Harlow, Primary Affectional Patterns in Primates," American Journal of Orthopsychiatry, 1960, pp. 676 to 694.

model that structuring the child's perceptual experiences will make significant differences in the level of audio and visual acuity.

Up to this point, little systematic effort has been made to provide schools with learning opportunities for increasing perceptual capacities, particularly auditory and visual. Furthermore, status-race-subcultural factors seem to contribute to the phenomenon of certain types of perceptual difficulty, although instruction and insight aren't well enough developed to make judgments of any certitude. What is apparent, however, is that schools for disadvantaged children are not producing significant results of lasting value.[15] For this reason there exists a great need for serious investigation in this area.

---

[15] Daniel C. Jordon, Compensatory Education in Massachusetts: an Evaluation with Recommendations, Amherst, Massachusetts, March, 1970, p. 4.

CHAPTER TWO

REVIEW OF THE LITERATURE

A. Development of the Motor Base for Perception

Many children do not see, hear, feel and experience as others. If a youngster cannot receive information correctly through his senses or is unable to organize it properly, then perceptual difficulty occurs. This is the child who is likely to achieve below his potential. In some cases the cause is due to neurological damage of some type. However, for many more the basic cause for inappropriate or ineffective seeing, hearing, feeling and experiencing is due to the child's lack of being effectively organized or structured internally, for receiving and organizing information is contingent upon this.

The child structures himself by interacting with the world in which he lives. The orderliness of his world has direct implications for the way he develops those internal structures on which subsequent perception depends. This implies a need for adequate consistency in his environment. George Early describes this as being an inner awareness on the part of the child of his own body in relation to space and time.[16] He comes to know where and what his body parts are, how they work together, and what they can or cannot do.. This positional and functional awareness of the body and its parts to each other

---

[16]George H.Early, Perceptual Training in the Curriculum (Columbus, 1969), p. 5.

and collectively to objects external to the body help the child to become aware of the body as a reference point to which he relates and orders the elements of the space-time world. When the child develops fully an internal structure then he can receive stimuli more appropriately, interpret it, and organize it in a meaningful and comprehensible way. It is generally agreed that in most normally functioning youngsters this internal structuring is relatively complete by the age of eight.[17]

Among the earliest learnings that a child experiences are motor learnings. He learns from the vestibular sense (equilibrium) and the kinesthetic receptors, (muscles, tendons, and joints) which provide feed-back to the central nervous system regarding the position and movement of the body parts. The motor information is that which is first organized.[18] Afterward, it becomes related to both auditory and visual activities. For instance, when the child reaches his arms out for his mother, he either hears or sees her at the same time. It is this internal, organized awareness of the body which develops from the processing of motor information (usually preceding visual organization) that forms the foundation structure upon which all other perceptual information is in turn structured.[19-20] This has important implications for the remediation of learning

---

[17]Ibid., p. 12

[18]Ibid., p. 10

[19]Ibid., p. 10

[20]H. Werner, Comparative Psychology of Mental Development (New York, 1957), p. 60.

difficulties, all of which require perceptual acuity.

The first step in developing this base structure is learning to differentiate body parts and their movement from undifferentiated mass movement of the body limbs, proximo-distal--from the center of the body outward--and cephalo-caudal--from the head to the toes. Proximo-distal involves the trunk, shoulders, upper arms, elbows, forearms, wrists, hands and fingers; and cephalo-caudal involves the head and neck, shoulders and trunk, knees, legs, ankles, feet and toes. As a child develops these differentiated movements, they must be integrated into general patterns of movement as opposed to specific ones.

The second step involves developing the awareness that the body has two sides (laterality). As the child begins to structure space in relation to his own body, he imposes his internal structure on the outer world and increasingly becomes aware of the separation, and the fact that external reality can be known in relation to the two sides of his body.

The child gains an awareness of up and down (verticality) and three dimensionality very much in the same way as he gains laterality--through muscular action to maintain balance. At this stage the dual process of the child gaining internal structuring from the experience of structuring space becomes more apparent as he actually structures space because of a more highly developed internal structure (a hypothetical construct)--an interesting and vital counterpoint. The more organized and structured the base structure becomes, the more likely the child is going to make meaningful wholes out of what might otherwise be a sensory jumble. It is interesting to note that vision requires this structure before one can organize visual symbols.

George Early hypothesizes the following sequence in the development of the perception process:[21]

a. Motor base--where the base structure is developed.

b. Motor-perceptual level--where incoming data for perception is matched to the motor base. At this level the hand leads the eye.

c. Perceptual-motor level--where incoming perceptual data can lead motor activity. An example of this is where the eye guides the hand.

d. Perceptual level--where incoming sensory data is organized into meaningful patterns without overt reference to the motor base.

e. Perceptual-conceptual level--where concepts develop from percepts.[22]

f. Conceptual level--where conceptualizing may take place independently of any overt perceptual activity.

g. Conceptual-perceptual level--where perception is conditioned by previously developed concepts.

While more research is needed to further substantiate this view, that which is now available suggests its reasonableness.

---

[21] Ibid., p. 21.

[22] A percept is the consolidated impression of a visual or auditory event.

B. Perceptual Systems

We now know that the old theory that each sense has its own discrete specialized receptors that only excite the corresponding sensory nerves is not so.[23] While basically we can consider eyes, ears, nose, mouth and skin as exteroceptors; end organs in muscles, joints and inner ear as proprioceptors; and nerve endings in visceral organs as interoceptors, we know that they can join together in various arrangements to register the behavior of the individual as well as external or internal events. Proprioception does not necessarily depend solely on proprioceptors; exteroception does not necessarily depend solely on exteroceptors. External senses must be conceived as systems rather than channels, interrelated rather than mutually exclusive. As a part of a perceptual system they function as sources of knowledge as well as receivers of sensations. This, then, leads us to a distinction between perception and proprioception. Perception is the process of receiving information, either imposed or obtained. Proprioception, imposed or obtained, results from performance using the motor system of the body.

1. Basic orienting system--consisting of the apparatus of the inner ear which registers forces of acceleration, specifying the direction of gravity, and beginning and ending movements of the body.

2. Auditory system--specifies the nature of vibratory

---

[23] James J. Gibson, The Senses Considered as Perceptual Systems (Boston, 1966), p. 48.

events, and through the use of both ears specifies the direction of the event.

3. Haptic system--consists of a complex of sub systems, having no "sense organs" in the conventional notion. The receptors are in the tissues and joints specifying a variety of things about the adjacent world.

4. Taste-smell system--where nose and mouth join receiving and specifying a variety of facts about the same events.

5. Visual system--combines with other apparatuses, overlapping in registering objective facts.[24]

The basic orienting system has a statocyst organ--a sac filled with fluid and lined with mechanoreceptors of a ciliated type, the hairs being stimulated by a weight which can be displaced relative to the sac. The receptors discharge when the hairs are bent. Through the activity of this organ, the organism is oriented to gravity and movement in conjunction with skin receptors in their contact with the environment. In man, this organ is the inner ear. It gives information about linear and rotary movements and the relation of the body to the force of gravity.

The apparatus for auditory perception receives distant and internal vibratory events in the form of sound waves which form both the event and the direction through the position of the wave in their differential relation to the two ears. Pitch, loudness, duration, abruptness of beginning and ending, repetitiveness, rate, regularity of rate or rhythm, timbre or tone quality, vowel quality, approximation to noise, direction

---

[24] Ibid., p. 50.

of loudness, and change of loudness are some of the variations in sound. Others are rubbing, scraping, rolling, brushing, and natural versus artificial sounds. Language derives from the interrelationship of vocal and auditory activities in concert. Either through the association of behavior and sound, or the practice of vocal-auditory activity, the organism begins to represent the two dimensions symbolically through language, thus resulting in communication. From this understanding we see the apparent need for auditory acuity.

The haptic system and its components make possible an awareness of the adjacent world through the body's experience with that world. This system utilizes the skin and the mobile body with its appendages and artificial extensions (such as a held stick or pair of scissors) transmitting shape, surface, material composition and consistency, temperature, and pain, information to the organism.

The tasting-smelling system works in concert to register sweet, salt, sour, and bitter information. Separately the tasting system can receive information regarding surface texture, consistency, shape, weight, and granularity, and a whole host of other characteristics.

The visual system provides sky-earth discrimination, detects gross features of the environment such as a change in light, identifies objects in the environment, changes in sequence, day from night, gross motions and events that occur. Animals that swim or fly have the problem of how to avoid being carried away from their accustomed habitat. To keep this from happening, they anchor themselves visually to part of the stream bed or a section of the terrain. They rely solely on visual information. However, with humans, the reliance is not only on visual information, but all the information provided by all the reception systems.

In attempting to understand the process of perception one is inclined in simplistic fashion to think of a chain of obvious and easily identifiable events, happening consistently, from reception to percept. A close look at the body of research regarding perception indicates otherwise, for the physical apparatus as well as a whole host of intervening influences either in part or collectively play a role in determining the form and nature of the final consolidated percept.

C. Built-in Determinants of Perception

There are built-in determinants of perception based on the inherent functions of the receptor organs, the characteristics of the projection areas (in the cortex) attached to the receptors, and the interplay between them. These are not fully developed at birth. Their development to full potential depends in large part on the impact of repeated experiences and normal growth patterns. The development of a base structure through learning to differentiate the body parts, and their movement from undifferentiated mass movement to differentiated mass movement to differentiated movement, awareness of laterality and verticality, and the interrelation between environment and base structure constitute the experiences which assist in developing the receptor organs and their projection areas to their fullest.[25]

D. Sets and Their Role in Perception

Allport,[26] Bruner,[27] Werner and Wapner[28] contend that there exists, prior to proximal stimulation, states of the individual referred to as "sets," "hypotheses," and "sensoritonic states," which influence profoundly what happens later in the perceptual process. Just as it is impossible to attend to all stimuli, the lingering traces of former perceptions cause certain stimuli to capture the attention. A falling tree which may have startled one in the past may cause one to notice the slightest movement in trees imperceptible to those not having the prior experience.

These perceptual frames of reference are required at the rudimentary stages of perceptual development. These develop with practice. For instance, the child should be exposed to pure tones to form auditory frames of reference. Use of

---

[25]George H. Early, Perceptual Training in the Curriculum (Columbus, 1969) p. 10.

[26]F. H. Allport, Theories of Perception and the Concept of Structure (New York, 1955).

[27]J. S. Bruner, Personality Dynamics and the Process of Perceiving. In R.R. Blake and G. V. Ramsey (Eds.), Perception: An Approach to Personality (New York, 1951).

[28]H. Werner and S. Wapner, "Toward a General Theory of Perception," Psychology Review, 59 (1952), pp. 324-338.

anchoring stimuli--clear first examples--serve as clearly discriminable perceptual frames of reference which orient the perceiver to make finer discriminations which are more meaningful in their structure.

When possible, two afferent centers should be activated contiguously to produce an association and possible metabolic change to enhance the efficiency of both and show their relationship. An example of this is the "over perception" that comes when a valued stimulus has been associated with a previously developed memoric schemata. This schemata contains a refinement in responses, the last of which being the one most likely to occur (canalization process where affect cathexes to stimulus and sensitizes one to future perceptions). Schemata start their work before the individual becomes exposed to the stimulus. It influences the level of expectancy and attending and continues to exert its influence until the final percept is structured and assimilated. It acts as a censor of incoming stimuli and assists in determining how they will be classified, understood, and how inferences from them will be drawn to give meaning to the percept.

E. Prior Experiences and Their Effect on Perception

It has also been demonstrated that certain activities which occur moments before stimulation can prepare an organism for receiving particular stimuli.[29] Stimuli that one experiences in his daily environment, though at first unnoticed, come to have particular attention-getting properties, which may precipitate approach or avoidance behavior. This condition causes the sensory receiving network to get more of one stimulus and less of others.

F. Need and Its Effect on Perception

Need is also a very important factor in influencing the organism to respond differentially to certain stimuli. Organs have so many needs and those needs create what seems to be an innate attentive preparatory response causing the organism to marshall itself for either an avoidance or approach response, which in turn prepares the individual to select in a particular way certain stimuli from the thousands which are vying for entry and/or processing.

> . . . the conditioning of these preparatory, searching responses represents a molding of the attentive-preparatory processes by affective stimulation; and consequently the individual's expectancies or 'hypotheses' lead to a selectivity in reception.[30]

G. Time Lag and Autonomic Intervention before Final Percept

There exists a short time lag between reception of stimulation and the final percept--a process where autonomic activity is triggered that subsequently feeds back into the

---

[29] Charles M. Solley and Gardner Murphy, Development of the Perceptual World (New York, 1960), p. 41.

[30] Ibid., p. 21.

perceptual process by either raising or lowering the level of sensibility and functioning as a stimulus in the background context just as other stimulus traces do.[31] During this interval, analyzing and synthesizing activities take place and tentative assumptions and sensory input are structured into percepts. "Unconscious inferences are made."[32] These tentative inferences are tested and dealt with on the basis of their congruity or lack of congruity with the total context made up of perceptual, memoric, and automatic traces.[33] This sorting phase very well could involve further searching for stimulation particularly when the environment is extremely sparce. Early perceptual learning involves more trial and check than later learning. Also, there is less trial and check searching in a well illuminated, highly structured environment than a poorly illuminated unstructured environment.

H. Motivation as an Influence in the Perception Process

Motivation governs to a large extent the intensity of the role played by the internal influences such as hunger, thirst, sex, curiosity, and the need to maintain exteroceptive contact with the environment. On the one hand, where there

---

[31]Ibid., p. 21.

[32]Ibid., p. 22.

[33]It has been suggested by Hebb that previously internalized learnings structurally affect the neurological pathways to form traces which facilitate the reception and transmittal of stimuli that are related to those learnings.

exists a strong link between motivation and percept with implications of reward, the search for various classes of stimulation, the probability of sensory reception, the rate of sorting which intervenes between reception and percept, and the possibility of developing the cueing process that triggers a perceptual class of events are enhanced.

On the other hand, if the motivational stimulus has implications of punishment, then its presence can prevent percepts from being fully structured due to timing error or the absence of an avoidance alternative. Once avoidance responses have been internalized, they are very strongly imbedded in the organism. The incredible resistance to extinction of avoidance responses has been explained in the following way by Soloman and Wynn:

> . . . the organism responds so quickly that the anxiety never gets a chance to occur because the autonomic latency is longer than that of motor response. . . . anxiety is conserved.[34]

Also, they suggest that 'partial irreversibility' takes place--physiochemical balance is partially and permanently shifted so that readiness to respond in various ways is altered. For this to happen there must exist direct, afferent feedback both specific and diffused from viscera to cortical projection and motor areas of the organism. However,

---

[34]R. L. Solomon and L. C. Wynne, "Traumatic Avoidance Learning: The Principles of Anxiety Conservation and Partial Irreversibility," Psychology Review, 61 (1954), pp. 353-385.

experiments which involve blockage of sympathetic and parasympathetic pathways for autonomic feedback is not necessary for such feedback although it does facilitate it. The same is true of proprioceptive feedback.[35]

Regarding the matter of timing, Solomon and Wynn state:

> The time interval between the conditioned stimulus and the unconditioned stimulus is critical for traumatic learning. If the conditioned stimulus and the unconditioned stimulus are contiguous or the latter shortly follows, it will never consolidate into a full percept.[36]

We know from what the field of physiology has revealed that in the perception process, sense receptors are stimulated causing a chain of stimulation events. Receptors fire their respective associated sensory nerves which eventually pass through either the nonthalamic part of the brain stem or the thalamus, or both. Reticular tracts receive some of the stimulation while the rest travels the sensory nerve tract and its associated projected area. What happens in the reticular tracts in the brain stem and thalamus is crucial because the activity there serves to arouse the entire cortex and form the basis, physiologically, for the existence of a generalized drive state. Motivation, both deprivation and stimulation, arouse internal stimuli and emotional responses, triggering further internal stimulation. The emotional response may discharge hormones into the blood which inevitably will affect

---

[35] Ibid.

[36] Ibid.

the reticular system of the brain stem. From there it is likely that there will occur an overall arousal of the cortex as well as regulating sensitization of the specialized sensory projection area. It seems apparent, then, that motivation has both specific and general effects upon perception. As Gellhorn puts it, "The classic afferent nervous system may provide the content of perception but it does not provide consciousness; instead, the activity of the nonspecific reticular system, which is activated by interceptive, proprioceptive, nociceptive, and hormonal changes, seems to govern the process of perception in awareness."[37] Hebb has said: "The nonspecific afferents . . . have the function of toning up the cortex, providing a general facilitation to aid cortical transmission and so make it possible for the messages from the specific pathways to reach the motor system and have their guiding influence on behavior. The nonspecific pathways produce arousal: alertness, responsiveness, wakefulness, and vigilance."[38] This can sometimes happen internally without any overt indication as in the case of rejection.

I. The Effect of Reinforcement on Perception

The confirmation that comes from reinforcement of a

---

[37]E. Gellhorn, "Physiological Processes Related to Consciousness and Perception," Brain, 77 (1954), pp. 401-415.

[38]D. O. Hebb, A Textbook of Psychology (Philadelphia, 1968), p. 207.

percept exerts a strong influence in imbedding that percept. The reinforcement can take the form of affect arousal giving permanency to the registration process. Perception itself can act as a reinforcer. As Woodworth has stated, "Perception is always driven by a direct, inherent motive which might be called the will to perceive."[39] This is further supported by Hilgard who says that the goals of perception are (1) the achievement of environmental stability and (2) the achievement of clarity and definiteness in perception."[40] If this is true, then perception can function as its own reward. Perception is its own survival determinant, for organs and their functions emerge that are most successful in maintaining a species.

The question then arises as to when one should reinforce any given percept. We know that reinforcement during the perceptual act tends to interfere with the consolidation of the traces.[41] If one waits too long after perceptual consolidation, the memories are more likely to be influenced rather than the perceptual act.

Being able to avoid noxious stimuli can enhance perception.

---

[39]R. S. Woodworth, "Reinforcement of Perception," American Journal of Psychology, 60 (1947), p. 123.

[40]E. R. Hilgard, "The Role of Learning in Perception." In R. R. Blake and G. V. Ramsey (Eds.) Perception: An Approach to Personality (New York, 1951), p. 466.

[41]Charles M. Solley and Gardner Murphy, Development of the Perceptual World (New York, 1960), p. 53.

An unfortunate personal experience with poison ivy has made me keenly aware of its existence at distances beyond the perceptual threshold of most others. Conversely, when an individual is unable to avoid noxious stimuli nor escape it once it occurs, the organism defends itself by repressing affect which raises the recognition threshold. This causes the individual to actually see and hear less. Research indicates that it takes .2 of a second for a simple percept to reach full structure.[42] Noxious unconditioned stimuli presented between 0 and .2 of a second after stimulation will tend to disrupt the perceptual process before the percept can stabilize.

J. Stimulus Context and Perception

Stimuli surrounding (both contextual and immediately preceding ones) affect the perception of a given stimulus. They may have either distracting or motivational value depending upon whether or not they are congruent with those perceptual traces existing in the organism as well as their relation to the main one to be communicated. One way to induce such a motivating set is to first present repeatedly a sequence of stimuli that is congruent with the crucial percept stimuli that will shortly follow. This forms a context of memoric traces which determines how the final percept will be perceived. A second way is to give instructions of what is to

---

[42] R. S. Woodworth, Experimental Psychology (New York, 1938), ch. 27.

be expected. This arouses memories which sensitizes the subject to differential expectations. It has also been suggested that the impact of motivation is contingent upon the type and extent of affect-control behaviors in the individual's repertoire prior to the experience. The implication here favors a "loving" of learning as opposed to either hating or being indifferent to it.

K. Practice and Its Effect on the Perception Process

Repetition in handling similar stimuli enhances perception. It helps memory to become more stable and it also helps one to discern common properties between stored sensory information as sampling from many sources occurs simultaneously. Practice also develops expectancies about the environment in the form of memoric schemata.

In studies where the visual field was changed--either in reversing up and down characteristics or changing color--it was shown that experience in structuring stimulation determines to a considerable degree the way we perceive things and that perceptual acts become conditioned to stimulation produced by movements of the observer.[43] If the perceptual act and memoric act (which is the result of experience) agree, they both tend to facilitate each other giving increased strength to the percept.

---

[43] Charles M. Solley and Gardner Murphy, Development of the Perceptual World (New York, 1965), p. 215.

L. <u>The Role of Attention</u>

It is impossible to perceive without attending--the behavior which governs the probability of maximally receiving specific sources of stimulation.[44] As an act, attending is selective, integrative, and energetic. In this process there is one element which is preferentially picked out over the others in a conscious way. The organism has a way of ordering the priority of perceptual tendencies. Certain stimuli are high in the hierarchy of attention value (such as the bell of the ice cream truck). The result is a full-fledged victory for the dominant stimulus.

There are two explanations as to how the dominant stimulus wins out in gaining reception by the organism. One is referred to as the "fixed individual-changing environment" explanation which assumes that every stimulus can potentially be attended to. Whatever stimulus has primacy at the moment blocks attention to the other concomitant stimuli. This is sometimes referred to as the old law of "prior entry into consciousness."

The other one referred to as the "fixed environment--changing individual" explanation, views the individual as moving about, searching, scanning and seeking for specific forms of stimulation.

When one attends to a whole stimulus, there are peripheral

---

[44] Ibid., p. 177.

stimuli to which secondary attending is directed which then become integrated with the whole stimulus. It is as if, for instance, there were present in one camera a wide-angle lense to attend to the wide panorama and a telescopic lense to zero in on a narrow field. The human organism possesses this integrative functional capacity to change from "wide-angle to telescopic" in receiving both a narrow span of stimuli and a rather wide, though less arresting, range in perceiving his environment as an integrated whole.

To expand on what has already been stated, attention may be produced by generalized energy as well as the environment, as the organism responds to internal drives. Solley and Murphy contend that the source of energy is not as important as the fact that it happens.[45] When this energy is directed at one set of stimuli, it does so at the expense of other stimuli. In an experiment that demonstrates this principle, Hubel, Henson, Rupert, and Galambos discovered cells in the auditory cortex of the cat which can be activated by auditory signals only when the animal attends.[46] In a similar experiment, Hernandez-Peon, Scherrer, and Jouvet planted electrodes in the brain stem of a cat, the auditory pathway. The auditory nerve did not transmit auditory stimulation when the

---

[45] Ibid., p. 185.

[46] D. H. Hubel, C. O. Henson, A. Rupert, and R. Galambos, "'Attention' Units in the Auditory Cortex," Science, 124 (1959), pp. 1279-1280.

animal was attending to two mice in a bottle.

It has been found that some people invest most of their deployable energy in primarily one sensory mode.[47] This has been observed in children who tend to learn primarily through either the auditory or visual mode. This has serious implications for teaching methodology and curricula in developing learning competency in children.

M. Expectancy and the Perceptual Act

Expectancy can have a profound influence on the perceptual act. This redundancy of environmental information (events happening at regular intervals or under specific conditions making their occurrence predictable) is used by the individual to prepare himself for satisfying needs and avoiding unpleasantries. Woodworth found that there is also a trial-and-check phase between the stimulus and full structuring of perceptual awareness by examining changes in expectancies which occur in the presence of perceptual stimulus but before the percept is achieved and in full awareness of the observer.[48] There are several functions of expectancies: (1) they narrow the possible modes of action; (2) they direct one

---

[47] R. Hernandez-Peon, H. Scherrer, and M. Jouvet, "Modification of Electric Activity in Cochlear Nucleus During 'Attention' in Unanesthetized Cats," Science, 123 (1956), pp. 331-332.

[48] R. S. Woodworth, "Reinforcement of Perception," American Journal of Psychology, 60 (1947), pp. 119-124.

toward the arena where our needs are expressed as set goals (example: wishful thinking produces behavior which makes the desired event more likely to occur); (3) they may be rewarding (child expecting Santa Claus); and, (4) they lead one to endure hardship--readies one for adversity. Woodworth contends that there is a constant trial and check between the expectancy and what we grasp perceptually at the moment, with feedback being the essence of the process.[49] (Example: watching an artist fill in the color of a sketch outlined in charcoal and matching that against its potential form.) Percepts are associated with rewards, punishment, avoidance signals because of noxious stimulation, and values, all producing certain expectancies, and varying in terms of the way and extent to which they satisfy needs.

Expectancy can take the form of a task-set--a pattern for doing, looking at, or experiencing things. There is also a task attitude which governs one's trend of selection. Together they determine what will be perceived and which perceptual acts will be learned.

N. Consciousness and Perception

Consciousness plays an important part in the process of perceiving. Sartre and Stern contend that there are two levels

---

[49]Charles M. Solley, and Gardner Murphy, Development of the Perceptual World (New York, 1965), pp. 156-157.

of consciousness: (1) non-reflective consciousness, when one experiences the world immediately, and (2) reflective consciousness, the awareness of being conscious. Others have referred to the same duality as perception--a sensory impression, and apperception--when one apprehends structures and brings them to clear comprehension.[50] There are two views regarding the mechanics of consciousness. Ribot defines the first as a process where stimuli are captured, and the stimuli along with its intensity affect the receptors in such a way as to produce movement to either receive, avoid, or control the stimulation.[51] The second is discussed by Stagner and Karwoski, where the organism scans in search of specific forms of stimulation to respond to maximally.[52] Observation would indicate that both take place. Hebb implies that from a physiological point of view that consciousness is a super-sense organ (involving central and sensory facilitation) which regulates the entire input of messages.[53] The organism can defend itself by refusing to accept certain messages. This blockage can also occur at the subcortical level as in the experiment with the cats mentioned earlier. Another example is where

---

[50] Ibid., p. 192.

[51] T. Ribot, <u>The Psychology of Attention</u> (Chicago, 1911)

[52] R. Stagner and T. Karwoski, <u>Psychology</u> (New York, 1952)

[53] D. O. Hebb, <u>The Organization of Behavior</u> (New York, 1949), p. 146.

visual perception is dampened by attending to sound or odor. Thinking can block visual and auditory reception.

Consciousness builds habits of coordinations previously not under control. It also plays a dynamic role in learning new tasks, and in organizing new stimuli. Consciousness tends to produce a psychological future of experience--by consciously recalling past events, we project a psychological time element into the future and can try out various combinations of past experiences in advance of the physical action. As Katz has said, ". . . a fully conscious individual not only has experiences, but he is clearly aware of having them. He knows that he 'intends.' He can stand off from his experiences and make them objects of his reflection."[54]

We neither perceive all we are conscious of nor are we conscious of all we perceive. In subliminal perceiving, the stimulation is received, structured, given meaning without the percept ever being in our consciousness. Evidence of this can be found in the fact that there are specialized cells in the cortex that are activated only under conditions of attention. Cortical cells are involved in perception and can be activated only when attentional or conscious mechanisms are active.

O. Misperception

Given a normally functioning perceptual apparatus in a

---

[54] D. Katz, Gestalt Psychology (New York, 1950), p. 79.

normally functioning individual, if cognitive notions of reality are markedly distorted by affect, the individual's behavior is autistic. He is totally unaware that reality is being distorted. Piaget would say that he has not distinguished self from experience.[55] The child's notion of causation is based on the belief that objects and their properties exist only when he intends for them to do so. "The infant perceives a hanging rattle, he strikes it, it moves, he perceives that it moves, and the infant cognizes the 'cause' of the rattle's action as his original perception of it."[56] Causation changes to that of object being alive. What happens with most youngsters is that they experience enough sensory information that they come to separate early perceptions from affect. Through negative reinforcement of autistic perceptions they begin to achieve veridical perceptions.[57]

Children, according to Piaget, tend to anchor their attention to dominant objects in the field of vision or listening.[58] As they grow older, the act of attending becomes more complex, which lessens the prospects of misperception

---

[55] Charles M. Solley and Gardner Murphy, Development of the Perceptual World (New York, 1965), p. 65.

[56] Ibid.

[57] True perceptions.

[58] Charles M. Solley and Gardner Murphy, Development of the Perceptual World (New York, 1965), p. 189.

taking place. This growth can be enhanced by involving the child in a sequence of experiences which increases his sophistication of perceiving, from attending to dominant objects to including more of those stimuli which make up the entire context so that more accurate percepts can be organized.

The first interpretations have to do with sensory attributes of figure-ground, colors, tastes, odors, and intensity of experience. At some moment the activity of perception transcends to a higher level of differentiation and integration--from literal perception to assumptive perception or meaning. Penfield and Rasmussen say that there may exist two separate storage systems for the two levels of percepts.[59]

There is evidence that age, culture, and language influence visual perceptual organization. The questions of "how?" and "to what extent?" remain to be determined. Age seems to influence the way in which cause-effect relationships are perceived as has been implied earlier in the sequence from autistic to veridical perceptions. Piaget says that there is an observable change from primitive, phenomenological causal relationship to a more rational one. In the early years percepts are literally teeming with subjective elements. Piaget orders the evolution of perceptual causality as follows:[60]

---

[59] Ibid., p. 226.

[60] Ibid., p. 143.

1. De-subjectification of causality--beginning to see external agents as causal factors.

2. Formation of stable series in time--attaining discrimination of events in time and discounting sheer contiguity in time as an agent of causation.

3. Progressive reversibility of cause and effect--building up of more abstract "feedback" concepts of causation.

Note: Step 3 comes to a discernable level at about age eight.

Perceptual change cannot be interpreted entirely in terms of maturation and learning. The experiment which shows how coins are perceived differentially by individuals of different economic conditions shows that value plays a part in perceiving.[61]

Paradigm of Perceptive Flow

Needs →	Drive →	Affects →	Cognitive →	Affective
	Satis-faction or Frustra-tion	that are fused with cognitive dispositions	structures become dominant in process	component integrated with cognitive elements into a whole experience
(First requisite for perceptual learning)		(as child fuses wish with reality)	(primitive meanings of acceptance and rejection are assigned)	

The above illustration is a paradigm of the perceptual flow, starting with needs—inner and outer determinants of what

---

[61] J. S. Bruner and C. C. Goodman, "Value and a Need as Organizing Factors in Perceptions," Journal of Abnormal Social Psychology, 47 (1947), pp. 33-44.

stimuli are received, which results either in drive satisfaction or frustration producing affects which are fused with cognitive dispositions, as when a child joins wish with reality. Following this fusion, the cognitive structure becomes dominant in the process as when the individual either accepts or rejects the early meanings. They finally resolve with affective components integrated with cognitive elements to form a whole experience.

All of the above items represent the basic processes that make up the phenomenon of perception on which so many different kinds of subsequent developments depend. For this reason any program designed to enhance perception, particularly those dealing with disadvantaged children, must give consideration to these factors.

CHAPTER THREE

PERCEPTION ENHANCING PROGRAMS

Much of the work presently being done to develop educational experiences which enhance perception have focused primarily on the sensori-motor and pre-operational stages of development where the emphasis is primarily on the relationship of motor development to perception, and on teaching children to replicate visual configurations and to identify objects imbedded in a sensorially cluttered picture.

The Doman-Delacato program assumes that the motor coordination attained during the creeping and crawling stages of development, and the opportunities of visually interacting with the environment that creeping and crawling activities provide, collectively guarantee the coordination of both eyes working in concert, and the integration of visual behavior with that of the rest of the body--activities Doman and Delacato consider requisite in the act of reading.[62] They theorize that the majority of reading difficulties stem from the fact that creeping and crawling activities have been either partially or totally denied. Their basic assumption that creeping and crawling enhance neurological development in a way that determines the capacity one has for learning to read has been severely challenged by both professional

---

[62] T.V. interview of Dr. Carl Delacato on John Miller's Talk Show, Chicago Station. (Jan. 8, 1971).

neurologists and educators, and the accuracy of the research findings of individuals who have been in their program has been questioned.[63]

In the Frostig Program for the Development of Visual Perception, the author recognizes five visual perceptual abilities that seem to have the greatest relevance for academic development: (1) perception of position in space (. . . "the ability to differentiate letters that have the same form but differ in their position--such as b and d."),[64] (2) perception of spatial relationships ("the ability to recognize the sequence of letters in a word and the sequence of words in a sentence."),[65] (3) perceptual constancy (to be able to recognize known words when they are seen in an unfamiliar context, color, size, or style of print), (4) visual-motor coordination (prerequisite for reading and writing), and (5) figure-ground perception (necessary for the analysis and synthesis of words, phrases, and paragraphs).

The Developmental Learning Readiness program by Getman, Kane, Halgren, and McKee is based on the assumption that reading readiness--of which perception plays a central role--

---

[63] Melvyn Paul Robbins, The Delacato Interpretation of Neurological Organization - An Empirical Study (Chicago, Sept. 65).

[64] Marianne Frostig and David Horne, The Frostig Program for the Development of Visual Perception (Chicago, 1964), p. 10.

[65] Ibid., p. 10.

is not achieved through a mere passage of time, but rather is achieved as the result of participatory experiences the child has in four learning areas: movement, orientation, identification, and communication.

Regarding movement, the authors state that "an infant spends most of his first eighteen months finding out how to move himself and how to refine these movements for greater fluidity of motion."[66] His first challenge is to learn the "Art of Movement." Movement is the first step in his development of readiness for learning about the world outside of himself.

Orientation refers to the sequence of development that enables the child to know where he is in relation to objects in his environment. Movement is considered a critical ingredient for achieving the "Art of Orientation" for he cannot gain full skill in locating himself in his environment unless he can move. "Children at this age are building their own discriminations and making their own judgments."[67]

The "Art of Identification" refers to "the organization of things and people and their very specific meanings to a child himself."[68] He achieves and organizes his experiences

---

[66]G. N. Getman, Elmer R. Kane, Marvin R. Halgren, and Gordon W. McKee, Developing Learning Readiness, A Visual--Motor--Tactile Skills Program (New York, 1968), p. 4.

[67]Ibid., p. 4.

[68]Ibid., p. 6.

so he can group them into units of experience.

The "Art of Communication" involves the ability to transmit one's feelings to others and to think efficiently about one's problems. Finding common bases is considered the important factor in "turning abstractions into realities" thereby increasing one's knowledge.

The overview of perception training programs presented here gives a general idea of the efforts attempted to date. The writer's own personal experience with them indicates that none of them is complete enough to hold any significant promise for facilitating the development of perception, particularly for those youngsters whose perceptual difficulties are culturally derived because they either tend to place what the writer feels to be unwarranted reliance on the effects of psycho-motor remediation, or tend to address perception using almost exclusively the visual mode. What is required is a total perception development program, utilizing the best efforts of existing programs, and expanding them to include the entire spectrum of skills that represent evidence of perceptual behavior, taking cognizance of the methodological inferences that derive from an awareness of the part played by "sets," preceding experience, need, motivation, stimuli context, reinforcement, practice, attention, expectancy, and consciousness. This curriculum is an attempt to head in that direction.

CHAPTER FOUR

DEVELOPMENT OF THE CURRICULUM

A. Methodological Considerations

Before one can attempt to help youngsters function perceptually in a more effective way, there are several considerations which derive from the vast body of research that have profound importance on the nature and process of that undertaking. It has already been stated that attending behavior enhances immesurably the prospects of a stimulus being received, transmitted through the reception system, and registered in the cerebrum. There is a total physiological difference achieved when attending behavior is in operation which lends considerable support to the efficacy of the act of perceiving. Therefore, the imperative nature of attending behavior accompanying perceptual training cannot be overemphasized.

Behavior modification, as a teaching technique, has proved to be very effective in eliciting attending behavior.[69] Bushell, in his model, uses the coin economy technique--a process of dispensing coins as a reward for appropriate behavior (in this case learning behavior) which the child can then use to purchase desired experiences at a later date.[70]

The basis for Bushell's approach is found in stimulus-

---

[69]Personal conference with Lois Ellen Datta, Director of Evaluation, Project Head Start, in Philadelphia Penn.,Jan. 29, 1971.

[70]Eleanor E. Maccoby and Miriam Zelner,Experiments in Primary Education: Aspects of Project Follow-Through (New York, 1970).

response psychology and the use of reinforcement--a process which has been able to demonstrate that behavior can indeed be modified effectively.[71] This technique has been particularly effective with children who had "school phobia"[72] and were assisted in being able to function without anxiety in the school environment. The positive effect of reinforcement on imbedding a percept has been clearly demonstrated.[73] In Thorndike's law of effect he indicates that of several responses possible to a given stimulus, those followed by a feeling of satisfaction (all other things being equal) will be increased in their probability of recurring. We also know that reward reduces anxiety, and any behavior preceding the reduction of anxiety is increased in its probability of occuring again. Reinforcement, then, is an important technique to be employed by one who is attempting to effectively teach children, because of its motivational value, and because of the intrinsic role it plays in the perceptual act described in chapter 1.

The human organism is limited in terms of the variety of things to which it can attend at one time. Broadbent suggests that the human organism can only attend to more than one thing at a time when the items are related together in an organized whole. He says that there is a filter mechanism, into which everything goes, that determines which stimuli are

---

[71]Eleanor E. Maccoby and Miriam Zelner, Experiments in Primary Education: Aspects of Project Follow-Through, (New York, 1970).

[72]An aversion to attending school.

[73]E. R. Hilgard, "The Role of Learning in Perception," eds R.R. Blake and G. V. Ramsey, Perception: An Approach to Personality (New York, 1951), p. 446.

important and therefore should go to higher centers for analysis. Deutsch describes the same process as the existence of a level of attention which acts as criterion for a relevant stimulus.

Very often awareness--a general condition of consciousness--is a pre-condition for attention which not only facilitates attending behavior but also gives direction to it, and activates and orients the entire system to a higher stimulus receiving level than if it were not functioning.

The important implication here is that it is the teacher's responsibility to influence the child's behavior in such a way that the child comes to a lesson with a general state of "awareness" so that the teacher might complement that condition with a teaching approach that elicits the attention of his student, thus maximizing his reception capability. One such device is set induction--a technique that is important for two reasons: (1) it has attention gaining properties and (2) it establishes a perceptual frame of reference, a "staged context," which screens sensory cues and guides mediation activities in such a way that the perceptual apparatus of the learner is led in a specific direction, increasing the probability that a particular percept will reach consolidation.

Sometimes one would choose to employ the technique of set induction well in advance of a given lesson so that it forms an expectancy--a powerful variable of perception which has a facilitating effect on the general level of consciousness as well as attention itself.[74] As an example the anticipation of Santa Claus serves only too well to remind us of the potential impact expectancies can have in arousing the entire organism to receive critical stimuli in an effective and meaningful way.

"Set" also has a deeper implication which has to do with the organization of structures or schemas in the cerebrum which determine the level of one's ability to perceive and conceptualize. This type of set formation requires the presentation of perceptual learning experiences in an organized and sequential way. For example the ability to categorize requires the ability to deal with more than one perceptual dimension at a time. Furthermore, differentiating between various forms cannot take place until figure-ground discrimination is fairly well developed. So, prior experience determines in large part the efficacy of perceiving. Consequently, careful thought must be given to how the perception enhancing experiences are ordered.

This brings us to the subject of motivation. Probably the most important motivational device which this program should incorporate is that of ensuring for the learner a succession of success experiences. Each lesson should carry

---

[74] R. S. Woodworth, "Reinforcement of Perception," _American Journal of Psychology_, 60 (1947), pp. 119-124.

with it definite implications of reward, both in terms of the intrinsic satisfaction that comes from being successful with the lesson as well as the support received from the teacher when he relates to the child in a positive, human, and supportive way as he gives assistance. The feeling of satisfaction that comes from success greatly enhances the desire and the enthusiasm with which a youngster enters successive related tasks. A warm emotional response associated with those successes further facilitates the motivational level of the student, and gives him the incentive to take on even more difficult activities. Social scientists have demonstrated that incentive learning is always quicker and more effective.

With this in mind, the teacher must consider the relationship of attention, expectancy, consciousness, prior experience, sets, motivation, and reinforcement along with the subject content of the lesson in designing an approach which will carry the highest learning potential for children.

B. Developmental Considerations

A meaningful curriculum necessarily must consider what is happening developmentally to the students, both in terms of how they are growing intellectually as well as the effect social influences may have on the rate of their total growth, which encompases the development of the intellect. "Intellect develops, according to Stendler's interpretation of Piaget, not by virtue of maturation alone, nor by learning alone, but as a result of the interaction of the child and his environment."[75] Therefore, one must be aware of and acknowledge that there are inner determinants that influence what a child is capable of handling that interact with external influences, which collectively contribute to a child's performance and achievement.

Stendler describes this as a process where "new elements (enter the child's system) to cause a new disturbance" which reconsolidates and is resolved in the form of a new concept--as in the conservation of weight characteristic of the stage of "concrete operations" described later.[76] As a child interacts with his environment, his experiences confirm in a consistent way the truths underlying them, and they become a part of the child's increased understanding. Piaget refers to this process of receiving new information and incorporating it as a dual process of assimilation and accomodation. Assimilation is the reception of new and seemingly incongruous information, and accomodation is the process of reorganizing the new information so that it is congruent with previous understandings that have now been modified.

As the child grows in awareness, he progresses through a succession of stages of increased intellectual functioning. Piaget calls the first one the sensori-motor stage.

---

[75] Celia Burns Stendler, ed., Readings of Behavior And Development (New York, 1964), p. 320.

[76] Ibid., p. 320.

1. Sensori-Motor Stage

In this stage (approximately the first 18 months of life) there are basically four areas of intellectual growth--space, time, matter, and causality. At the beginnings of assimilatory activity any object presented to the child by the external environment is received as something to suck, to look at, and later to grasp. He gains some notion of the presence and absence of those objects, as well as attains an awareness that he can play a part in their location and motion. Through a process of personal activity with these objects he gains an ever expanding notion of their physical properties and location, and can initiate a causal relationship in terms of what happens to their location.[77]

Objects, which formerly existed when he intended for them to exist, begin to achieve permanency. Causality which formerly is seen as a property of the object itself, is seen as something which is acted upon, even by himself. Basic notions about the passage of time begin to emerge as the youngster anticipates feeding or being picked up when he hears his mother's footsteps. In short, at this initial stage the organism begins the process of seeing himself and his actions not as logical operations of thought, but rather through sensori-motor acts.

---

77 Jean Piaget, The Construction of Reality in the Child (New York, 1954).

a) Two to Three Months of Age - This is the stage of "primary circular reactions" "where the child's behavior (voluntarily) brings about, prolongs, and repeats some state of affairs that had not previously occured."[78] They are identified by the results they produce. An example is systematic thumb sucking. Vision is a second, which changes from a blank sort of fixation on objects to actually examining them with an intentness of expression and alertness. Being able to "see" an item as an object requires the concept that the object is separate from the child. Searching for an item that has disappeared is indication that the child has begun to see that object as something distinct and separate. During this stage the child develops prehension--the ability to grasp and obtain objects, and later to bring objects to his mouth.

b) Four to Eight Months of Age - This is the stage of "secondary circular reactions"[79]--the beginning of intentional adaptation where it appears that desire pre-exists gratification. In this stage the child is aware of objects and is found searching for an object not in view. The child begins to cause material items to move from one location to another. He gains a notion of a stable external world in

---

[78]Alfred L. Baldwin, Theories of Child Development (New York, 1967), p. 204.

[79]Ibid., p. 207.

which objects maintain their identity.[80] He also develops visual-motor prehension--behaviorally responding to his own visual cues.

c) Eight to Twelve Months of Age - This stage is described as the one where there is "acquisition of instrumental behavior" and where the child actively searches for vanished objects. The child is able to use formation schemas in new situations (the ability to intentionally initiate an old pattern of behavior in a new situation). Learned behavior is free from its investigating situation. He is able, also, to imitate behavior in others without first having observed them in himself. Object awareness becomes keener in this stage.

d) Twelve to Eighteen Months of Age - This level is referred to as the stage of "tertiary circular reactions and the discovery of new means."[81] In this stage the child gains the ability to invent new behavior patterns which were never before performed. He repeats an act over and over, deliberately varying the actions, making them more adaptive, and therefore carrying important implications for problem solving behavior at a later date. At this level youngsters discover ways of dealing with their environment through trial-and-

---

[80] Ibid., p. 209.

[81] Alfred L. Baldwin, Theories of Child Development (New York, 1967), p. 214.

error. He learns the difference between letting go an object that is supported and one which is released in space. Co-ordination of related behaviors is being attained at this stage. Being able to respond in accordance with observational feedback when one is attempting to shift from one related activity to another is a capacity which emerges during this period. Object concepts become keener as the child reaches for a hidden object including removing obstacles to find it. He looks for the object where he last saw it, but does not arrive at any inferences about the possibility of it having been moved a second time.

2. Pre-Operational Stage

This stage includes a range of approximately 18 months to 7 years. This stage has been described as one where the child is still unable to engage in logical operations--forming understandings primarily on the basis of logical inferences. However, this stage does show evidences of the beginning of cognitive representation: ". . . the child can picture events . . . and to some degree follow them mentally."[82] He can solve problems mentally without overt trial-and-error, and he can perform deferred intention.

The inability to think in terms of more than one variable is also characteristic of this stage. In an experiment involving the physical transformation of one of two equal

---

[82] Ibid., p. 217.

balls of clay to a cylindrical form, the child (in this phase) tends to concentrate either on the thickness or the length of the cylinder, concluding that one has now either increased or decreased in weight, rather than seeing that an increase in length has been compensated for by a decrease in width.

A third characteristic of this stage is the inability to combine classes of items to make a hierarchy in classifications. While acknowledging that squirrels, dogs, and lambs are all animals, he tends to think that the smaller classification, lambs, constitutes the entire classification--animals. He doesn't understand the subsuming nature of broader more encompasing categories in the hierarchy of classifications. The problem lies in the fact that the child at this stage has difficulty attributing several characteristics to one thing.

3. Concrete Operations Stage

The stage of concrete operations follows the pre-operational stage and is characterized by the emergence of logical operations as evidenced in the ability to logically reverse a process (changing cylinderically shaped clay back to the original ball and to know that the amount of clay has remained constant). This knowledge will expand to understanding that a change in the shape of an object does not alter its weight (conservation of weight). This stage is also characterized by the ability of the child to combine items into a hierarchy of classifications and then reverse the process by taking them apart. He knows, then, that if all the cocker spainels die off, there still will remain dogs in the world. He would see that the spaces displaced by ten chevrolets on each of two equal sized lots is the same irrespective of their arrangement, and that the amount of space remaining on both lots is similarly the same. This stage begins at about six to seven years of age and runs through the beginning of adolescence--eleven to twelve years of age.

4. Formal Thinking Stage

A significant change in the child's thought processes takes place at about twelve years of age as the child enters the stage of formal thinking where he becomes more capable of abstract reasoning. "He reasons in terms of propositions, and he can make logical combinations of these propositions."[83] He can see the combined relationship and separate relationships of several variables to a proposition, such as the relationship of height and width to the area of a rectangle in the former, and in the latter, the disjunctive notion that beyond the speed limit, either speed or safety can be observed.

The curriculum for developing perceptual competence will therefore be organized around experiences appropriate for these developmental stages.

---

[83] Celia Burns Stendler, Readings of Behavior and Development (New York, 1964), p. 325.

CHAPTER FIVE

DATA SOURCES FOR THE CURRICULUM

A. Procedure for Developing the Curriculum

A number of curriculum development procedures were investigated, and it was decided that the rather unique and specific nature of this curriculum imposed certain requirements which would not be adequately served by any one of the existing curriculum models. Therefore, an eclectic approach to developing this curriculum was used, focusing mainly on the Tyler model. There were two data sources used: (1) the learner in terms of the various developmental stages he goes through and (2) the field of research and theory dealing with the phenomena of perception. Society as a data source, which the Tyler model suggests, was considered inappropriate in this case. Inferences and implications that derive from the literature about the process of perception were pulled together to form fifteen rather global generalizations. From those generalizations came a list of curriculum objectives--the first step in the operationalization of theoretical implications. The need to filter the objectives through a philosophical screen as suggested by the Tyler model was deemed unecessary. The objectives were then translated into an ordered sequence of perceptual skills categories which comprise the total perceptual process and collectively constitute the elements of perceptual competence. The final step was to develop and order, from simple to complex, concrete to abstract, learning opportunities designed to enhance one's ability to perform those skills. Prototypical lessons are given as guides to assist the teacher in planning other lessons. Following the prototypical lessons is a section dealing with evaluation.

B. Generalizations from the Literature	Curriculum Objectives
1. From birth on, the human organism requires auditory and visual stimulation to maximize the prospects of functioning at his potential physiologically and cognitively	1. To elicit the individual to overtly respond to visual stimuli that will vary in terms of size, form, distance and color. To elicit the individual to overtly respond to auditory stimuli that will vary in tone, pitch, volume, timbre, and location.
2. "The history of the evolution of the brain teaches that its primary function from the beginning is the regulation of the transformation of patterns of sensory experience into patterns of motor response."[84]	2. To direct the behavior of the child by using visual and auditory cues.
3. The positional and functional awareness of the body and its parts to each other, and collectively to objects external to the body, help the child to become aware of the body as a reference point to which he relates and orders the elements of the space-time world.	3. To order a sequence of physical exercises and activities that use the body as a referrent in interacting with the physical environment.

[84] Ray Baruch, Enriching Perception and Cognition (Seattle, 1968), p. 40.

Generalizations from the Literature	Curriculum Objectives
4. The internal, organized awareness of the body which develops from the processing of motor information forms the foundation structure upon which all other perceptual information is in turn structured.	4. To replicate in a sequence of exercises those physical skills which further the development process.
5. Gaining a sense of equilibrium is basic to the whole process of orienting one's body to the external world and appropriately receiving information from that world.	5. To provide activities which required displaying a sense of balance as a means of developing and refining the sense of equilibrium.
6. As the child begins to structure space in relation to his own body, he imposes his internal structure on the outer world and increasingly becomes aware of the separation, and learns that external reality can be known in relation to the two sides of his body.	6. To provide experiences which require a sense of laterality and verticality so that the child can develop and refine these skills.
7. When the various modes of perception begin to work in a functionally integrated way, the organism increases its capabilities for receiving, sorting, storeing, and utilizing information in a meaningful way.	7. To provide experiences which involve employing more than one sensory mode to participate in the activity.
8. Eye-hand coordination, an expression of the integration of the motor and visual systems, makes it possible for the child to interpret directions in space and to control his movements which are both activities that assist the perception of forms and symbols.	8. To sequence a series of experiences for children that involve an integration of eye and hand activities.

Generalizations from the Literature	Curriculum Objectives
9. Understanding causation is basic to perceiving accurately.	9. To provide experiences for children which demonstrate the many sources of causation in the movement of environmental objects.
10. The ability to distinguish figure from ground is fundamental to visually perceiving any stimulus in the environment.	10. To sequence visual experiences which help youngsters to discern figure and ground differentiations.
11. Speed and accuracy of form and sound recognition in large part are contingent upon learning.	11. To give children a variety of experiences in recognizing the many familiar forms and sounds that collectively comprise his environment.
12. Form, size, distance, and color constancy (seeing the identity of a form, size, distance, and color in various contexts) is prerequisite to learning to read and understand.	12. To provide a sequence of experiences which help children to understand constancy of form, size, distance, and color.
13. Visual and auditory memory are necessary for language and cognition.	13. To provide experiences which enhance a youngster's ability to remember sounds and visual symbols and forms.
14. Cognition requires organizing stimuli into categories and then into a hierarchy of categories. (The brain is incapable of attending to and referring to each item singly.)	14. To provide opportunities for youngsters to label and categorize various stimuli in categories.
15. Once information about the environment is labeled, classified, and ordered in a hierarchy of classifications, it then has a	15. To provide opportunities for youngsters to group categories of various stimuli into hierarchies of classifications.

Generalizations from the Literature	Curriculum Objective
directing, facilitating, and monitoring influence on the perceptual process.	

C. Developmental Stages and Perceptual Skills

The chart which follows gives one an approximation regarding the developmental stage during which each category of skills should be experienced by the student. It is important that one make this determination more in terms of the developmental characteristics of the child rather than relying exclusively on his chronological age as an indication. This requires the teacher to observe closely each child and determine, in terms of his developmental characteristics, the level at which he is functioning, so that the perceptual skills with their accompanying learning opportunities might be ordered and sequenced for him in the most appropriate way.

Some of the learning experiences and equipment are peculiar to our culture. If this condition should occur, cultural equivalents should then be substituted.

It is important to note that while limited sections of the Frostig and Getman, Kane, Halgren and McKee programs have been suggested, that this curriculum basically represents a drastic departure in methodology, scope and sequence of activities, and the generalizability of activities to other aspects of the regular curriculum. It also requires a careful analysis of where the student is in his development as a critical determinant of what he experiences in perception development activities as opposed to a total disregard in the other programs.

PERCEPTUAL SKILLS	SENSORI-MOTOR STAGE 1. a) Two-Three months	b) Four-Eight months	c) Eight-Twelve months	d) Twelve-Eighteen months	2. Pre-Operational Stage 18 months-7 years	3. Concrete Operations Stage 7 to 12 years	4. Formal Thinking Stage 12 years
1. Motor-base development							
a) Visual and Auditory Stimulation	■	■	■	■	■		
b) Relationship of Body to Space and Time	■	■	■	■	■		
c) Equilibrium	■	■	■	■	■		
d) Auditory, Visual and Body Movement Integration		■	■	■	■	■	
e) Eye-Hand Coordination			■	■	■	■	
f) External Causation			■	■	■	■	■
2. Perception of form and spatial relationships							
a) Figure-Ground					■	■	
b) Form Recognition and Symbolic Representation					■	■	■
c) Auditory and Visual Sequence					■	■	■
d) Constancy					■	■	■
3. Cognitive Elements							
a) Visual Memory					■	■	■
b) Classes and Class Hierarchy					■	■	■

CHAPTER SIX

CURRICULUM FOR DEVELOPING PERCEPTUAL COMPETENCE

This curriculum is developed around a number of considerations beginning with the development of the motor-base, and proceeding through perceptual development and a description of related cognitive aspects. Each skill represents an important element in the total perception process, and since the accompanying learning experiences are ordered from simple to complex, they can be used as diagnostic exercises to determine one's present level of functioning as well as treatment exercises to enhance one's ability to perform those skills.

A. <u>Perceptual Skills</u>

1. <u>Motor Base Development</u>

a) <u>Visual and Auditory Stimulation</u>

Objective: To overtly react to the environment through exposure to a variety of auditory and visual stimuli.

<u>Learning Opportunities</u>

1. Experiences for eliciting attending, reaching and moving responses to auditory and visual stimuli:

   a. Patterned bumper pad and bed linen.
   b. A different pattern board hung on the side of the crib each week. (Alternate sides daily)
   c. Crib aquarium (Plastic bag filled with bright objects and fish)
   d. Crib mobile with bright objects.

2. Experiences for eliciting attending, reaching and moving responses to auditory and visual stimuli which require movement and reaching:

a. Crib gym.
b. Busy box.
c. Music box Ferris wheel.

Experiences for differentiating auditory and visual stimuli by imitation.
(Beginning at 10 months of age)

a. Imitation of voice (where child repeats noises he hears and rhythm patterns he hears)
b. Imitation of expressions (where the child imitates the faces he sees an adult make)

4. Experiences for differentiating various stimuli through gognitive mediation:

a. Paper bag containing items (where the child identifies them by feeling them)
b. Tactile cards--fur, suede, satin, cotton, paper, glazed paper, cellophane, feeling template and drawing (the child mediates his experience with language)
c. Sound effects for stories.

5. Auditory experiences:

a. Child should be sung to and rocked during feeding time.
b. Child should be spoken to during diapering, feeding, and other times when in contact with adults.
c. Music with simple, clear melody.
d. Identifying the following sounds:
(For children, beginning approximately at age 4.)

Tearing paper, sharpening pencil, walking, running, shuffling, clapping, sneezing, coughing, tapping various materials, jingling money, opening window, pouring water, shuffling cards, blowing whistle, banging blocks, ringing a bell, vibration sounds, sweeping sounds, raising a shade, beating erasers, bouncing a ball, rattling a rattle, snapping on light, knocking on door, blowing pitch pipe, dropping objects, moving a desk, moving a chair, snapping fingers, blowing nose, opening and closing drawers, stirring paint, clearing throat, clattering teeth, closing pocketbook, clicking tongue, leafing through pages of book, cutting with scissors, shaking paper clips in a glass, breaking chalk, rattling keys, snapping rubber band, crumbling paper, writing on blackboard, opening a box, voice sounds (sighing, etc.), striking a match, rubbing palms together.[85]

e. Nursery rhymes and jingles such as "I'm thinking of a word that rhymes with . . ."

f. Concepts experiences demonstrating:

1. Near/far
2. Pitch
3. Loud/soft
4. Vocal/non-vocal
5. Same/differences
6. Timbre
7. Beginning and final consonant sounds
8. Loudness, duration, abruptness of beginning and ending, repetativeness

g. Audio event story (To determine what the sequence is)

b) <u>Relationship of Body to Space and Time</u>

Objective: To interact with the environment through body movement.

1. <u>General movement</u>:

a. Turn youngster in his sleep to experience sleeping on both sides.
b. Prop pillow at feet so that the child can push up against it.
c. Allow and encourage child to splash in bath water.
d. Rock child in rocker while feeding the bottle.
e. Allow child to lie in crib without clothes.

2. <u>Reaching and grasping</u>:

a. Crib gym
b. Crib pulley

3. <u>Creeping and crawling</u>:

a. Let child explore the floor.
b. Arrange inclines for child to crawl up.

4. <u>Walking activities</u>:

a. Bouncer

---

[85] Betty Van Witsen, <u>Perceptual Training Activities Handbook</u> (New York), p. 31.

b. Walking stroller.
c. Lead child around by holding his hands.

5. Hopping and Skipping:

a. Hopping and skipping games. (potato sack race)
b. Relays
c. Rhythm games

6. Coordination of body movements and sidedness: (For children beginning at approximately age 3)

a. Head roll; head lift; head lift and roll; bilateral action--bilateral arm movement, bilateral leg movement, bilateral arm and leg movements; alternating actions--head and alternate arm movements, alternate arm and leg movements; exploration of gravity with body parts--variations, rolling, rolling situps, hands and knees roll, hands and feet roll, creeping, hopping, jumping, skipping.[86]

c) Equilibrium

Objective: To perform physical activities which require demonstrating a sense of balance.

1. Balancing:

a. Prop baby up with pillows in a sitting position for short periods of time.
b. Hold child by the thighs and let him try to balance his torso in an up-right position.
c. Swing in a swing.
d. Allow child to push himself around on a belly board with wheels.
e. Crawl through a tunnel.
f. Crawl up an inclined plane.
g. Ride on train with wheels.
h. Ride on a rocking horse.
i. Walk down stairs.
j. Use sliding board.
k. Use a see-saw.

2. Walking balance:

a. Walk on a line made on the floor (straight first

---

[86] G.N. Getman, Elmer R. Kane, Marvin R. Holgren, Gordon W. McKee, Developing Learning Readiness (New York, 1966), pp. 21-44.

and then a crooked one)
b. Walk across a wide balance board.
c. Hula hoop.
d. Climb a ladder.
e. Walk a balance beam with shoes off-forward and backward.
f. Using balance board, move front and back and side to side.

3. Jumping balance:

a. Hopping, sliding, and galloping.
b. Skipping and leaping.
c. Jumping on jumping board.
d. Pogo stick.
e. Jump rope.
f. Hop scotch.
g. Skating.

4. Riding balance:

a. Kiddie car
b. Trapeze
c. Tricycle
d. Bicycle
e. Scooter

5. Rhythms:

a. Rhythm games:

1. Clapping rhythms.
2. Walking, running, hopping, jumping, leaping, and combinations of these activities to the rhythms of various songs.
3. Jumping rope to a prescribed rhythmetic pattern.
4. Nonlocomotor or axial rhythm experiences such as bending and twisting the body, swinging arms and legs, and swaying forward and backward.
5. Folk dancing.

d) Auditory, Visual, and Body Movement Integration

Objective: To integrate auditory, visual, and body movement into a coordinated and related function.

1. Reaching and grasping response to visual and/or auditory stimuli:

a. Hand bright objects to child to elicit a reaching

response.
b. Crib mobile and crib gym.
c. Busy box for crib.
d. Rattle toys, music toys that child can activate by himself.
e. Use of facial expressions to elicit a response.

2. <u>Specific body movement responses to visual and auditory cuing</u>:

   a. Have child spend time with other children.
   b. Imitation games.
   c. Songs which call for eye, ear, and body responses.
   d. Identifying objects, places, and animals from verbal cues.

3. <u>Activities which cannot be done without coordination of body movement with visual or auditory system in an integrated way</u>:

   a. Blocks
   b. Buckle board, zipper board, buttoning board, and shoe tieing board.

e) <u>Eye-Hand Coordination</u>

Objective: To combine eye and hand behaviors into a related function.

1. <u>Reaching for and feeling a desired object</u>:

   a. Crib mobile
   b. Busy box
   c. Rattle toy
   d. Toast, celery stick, carrot stick to chew on.
   e. Teething ring.
   f. Drum

2. <u>Eyes working on concert</u>:

   a. Crawling activities
   b. Manipulative toys

3. <u>Drawing/writing activities</u>:

   a. Scribble writing
   b. Close dotted figure with line
   c. Drawing designs
   d. Draw forms using template
   e. Stenciling using paint or ink

4. Buckling, zipping, buttoning and tieing activities:

    a. Buckling, zipping, buttoning and tieing boards

5. Manipulating objects:

    a. Play dough and clay
    b. Finger painting
    c. Cutting exercises--large forms first
    d. Painting
    e. Peg board designs
    f. String beads
    g. Games: jacks, marbles, pick-up sticks

6. Puzzle activities:

    a. Geometrical forms
    b. Irregular shapes
    c. Recognizable forms in the environment
    d. Varied shaped objects that can be joined to make recognizable objects by using a picture guide.
    e. Tinker toys and Lincoln blocks, snap blocks, looney links
    f. Pencil maze
    g. Making objects from geometric shapes cut from colored paper.

7. Hand-eye activities accompanied by cognitive involvement:

    a. Circling specific large or small letters
    b. Cooking: measuring, peeling fruit and vegetables, buttering bread, pouring, etc.
    c. Sewing cards and cloth
    d. Japanese paper folding
    e. Balancing items on a scale
    f. Building with playing cards

f) External Causation

Objective: To recognize the true source of causation.

1. Recognizing the separate identity of objects:

    a. Manipulating physical objects (learns that they move when he causes them to move)
    b. Toys with wheels

2. Recognizing the permanence of objects:

    a. Keep environmental objects consistently present

(such as toys)

b. Hiding games (putting a toy under something and letting child find it.

c. Changing location of object that child has seen being placed under a different object.

3. <u>Differentiating between animate and inanimate</u>:

a. Nursemaid responding to cues from child

b. Playing with live animals and stuffed replicas

4. <u>Determining causation through logic</u>:

a. Stories and poems which deal with causation

b. "Who done it?" stories--can be made up by children

2. <u>Perception of Form and Spatial Relationships</u>

a) <u>Figure-Ground</u>

Objective: To distinguish figure and ground elements.

1. <u>Intersecting lines</u>:

The child is required to see two figure elements and to identify the point at which they intersect.
(Lessons 1-15)

2. <u>Intersecting figures</u>:

The child is asked to recognize and trace one of the figures the identify of which is partially obscured because it intersects another figure.
(Lessons 16-20)

3. <u>Hidden figures</u>:

Being able to identify a given figure imbedded among several others is required in these exercises.
(Lessons 21-31)

4. <u>Overlapping figures</u>:

Being able to recognize certain forms irrespective of the distortion influences of those figures it overlaps is required in these exercises.
(Lessons 32-44)

5. <u>Figure completion</u>:

The student is required to "visualize" the completed

form when presented with an incomplete one, and to draw in the missing section.
(Lessons 45-57)

6. Figure assembly:

Assembling predetermined figures so that they are recognizable.
(Lessons 58-59)

7. Similarities and differences of detail:

In these lessons, visual items are given that have some elements in common, and others which differ. The student is required to differentiate between them.
(Lessons 60-64)

8. Reversal of figure-ground:

The child is asked to match similar visuals among several where figure and ground properties are reversed.
(Lessons 65-69)[87]

b) Form Recognition and Symbolic Representation

Objective: To recognize a form or symbol and to demonstrate by word or act evidence of that recognition.

1. Identification of real forms in a field, simple to complex:

   a. Look for geometric forms represented in items located in the room and found in pictures.
   b. Find geometric forms found represented in the shapes of various items that make up the school neighborhood.
   c. Use geometric forms to reconstruct items found in the environment.

2. Identify semi-abstract shapes in a field, simple to complex:

   a. Use templates to draw various geometric forms.

---

[87] Marianne Frostig and Divid Horne, The Frostig Program for the Development of Visual Perception (Chicago, 1964).

b. Use templates to make pictures from various forms.
c. Exercises 1-14, pp. 131-134, Frostig Program.
d. Completion of figure exercises (assembling parts)
e. Completion of figure exercises (completing the drawing)

3. Identifying three-dimensional objects:

a. Draw simple three-dimensional drawings
b. Construct three-dimensional forms from pre-cut and lined paper.

c) Auditory and Visual Sequence

Objective: To remember visual and auditory events in a logical sequence.

1. Recognizing sequences of color, sound, form, weight, texture, function, and classification:

a. Arrange objects in relation to size, depth of color, weight, softness, hardness, fuzziness, texture, elasticity.
b. Cups with varying amounts of color dye--arrange in order of intensity.
c. Arrange fruit in order of size.
d. Arrange forms having same shape but varying in weight.
e. Arrange digging tools in order of size--spoon, cup, trowel, shovel.
f. Arrange animals in order of size and weight.
g. Give various classifications in hierarchy of classifications for a given animal, plant, etc.
h. Tell story and have the sequence of events related.
i. Give instructions and have someone repeat them.
j. Introduction game--each person introduces all who were introduced to him plus himself.
k. Whisper game.
l. Cut up story--(each event is printed on a separate piece of paper and passed out among the children. The child who thinks he has the first part reads it, etc.)
m. Rote learning sequence--alphabet, numbers, days of week, months.
n. Story with contradictory detail. Find the incongruous part.
o. Sequence of notes--arrange in ascending and descending order.

d) <u>Constancy</u>

Objective: To recognize symbols, objects, configurations, and forms irrespective of context in which they are found.

1. <u>Recognizing constancy of configuration</u>:

This exercise requires the student to identify a given form irrespective of its location within the context.

a. Exercises 16-70, pp. 134-145 and exercises 1-36, pp. 145-151 (Frostig material).
b. Find similar letters in various contexts.
c. Show various constancies in child's environment.

3. <u>Cognitive Elements</u>

a) <u>Visual and Auditory Memory</u>

Objective: To be able to recall from memory visual and auditory events.

1. <u>Remembering single objects and forms</u>:

a. Make objects from geometric forms.
b. Have children name object from your description.
c. Give description of a place--have child name it.
d. Store window--let child look for a given time and then turn away and name the items.

2. <u>Sequence of events</u>:

a. Cut up story.
b. Story with contradictory detail.

For example, a familiar nursery rhyme could be read with an event given out of place. Also, nonsense rhymes and poems can be used. A third example would be a series of pictures which indicate a logical sequence of events. However, one picture would be placed out of order. The child would be asked to tell what happened, and to identify the event that is not in its proper order.

c. "I packed Grandma's trunk with a _______." (Fill in with the name of a fruit, animal, place, etc. in alphabetical order.)

3. Sequence of functions:

   a. Have child tell how to get from one place to another.
   b. Each day, vary directions and see how many are able to follow.
   c. Tell how to do or build or make something.

b) Classes and Class Hierarchy

Objective: To group like items under a subsuming category and label.

1. Grouping in classes:

   a. Put blocks away according to shape.
   b. Group geometric figures.
   c. Group fruit together from hodge podge of various real items.
   d. Group cars together from a variety of assorted items.
   e. Group red cars together from a variety of assorted items (two dimensions).
   f. Group white Chevrolet trucks together from a variety of assorted items (three dimensions).
   g. Grandma's trunk game.
   h. Have an array of pictures and group those with same beginning consonant.

2. Grouping classes in a hierarchy:

   a. List of words to be arranged in a hierarchy (house, neighborhood, town, county, state, country, continent, hemisphere, world, etc.)

B. Prototypical Lessons

I. Visual and Auditory Stimulation

Objective: To respond behaviorally to the presence of auditory or visual stimulation.

Motivation: The presence of a cradle gym which has bright colors, a bell and a wood hammer that strike when a string is pulled.

Procedure:
1. Clamp cradle gym on the crib.
2. If the youngster doesn't reach for it, pull

one of the strings to arouse his attention and interest.

Expectation: The child will become actively involved in grasping the different parts of the cradle gym as well as experiencing the relationship between pulling a string and having either the bell ring or the hammer strike a block of wood.

Evaluation: Use observation to see if objective was achieved.

II. Relationship of Body to Space and Time

Objective: To explore an area of floor space and relate to physical objects in that area by grasping, hold, and dropping them.

Motivation: Take child's clothes off and use a satin blanket and bright colored objects and toys.

Materials: Satin blanket, various geometric forms and bright colored toys.

Procedure:

1. Put child on blanket.
2. Introduce one object at a time. (Place within three feet of child.)
3. Call the child's attention to the object by putting it in his line of vision if he does not notice it and respond on his own.

Expectation: The child will move around on the blanket because of the freedom of movement possible and because of the soft feeling it provides. He will notice, reach for, grasp, and explore with his mouth physical items he sees on the blanket.

Evaluation: Through observation, see if the objective was achieved.

III. Equilibrium

Objective: To walk the length of a balance beam without losing balance more than once.

Motivation: Put the balance beam in full view of the children and attempt to walk it. Then ask if they would like to try. (Curiosity)

Material: Eight foot 2" x 4" with end supports.

Procedure: 1. Have the children take turns, lining up at one end, and attempt to walk from one end of the board to the other.

Expectation: For youngsters 4 years old, the expectation is that most of them will be able to walk the length without losing their balance more than once.

Evaluation: Through observation, see if objective was achieved. Record those who do not reach the objective criterion for additional involvement in balance enhancing activities.

IV. Auditory, Visual, and Body Movement Integration

Objective: To integrate eye, ear, and body movements as a result of auditory and visual cuing.

Motivation: Use of action oriented song.

Material: Song: "My Hand On Myself" (Optional use of recording as accompaniment)

Procedure: 1. Have the children stand at arm's length distance.

2. Have children identify the parts of their body by touch as they sing the song.

Expectation: Competence of reaching objective criterion to be related to child's understanding of his body parts. This would mean that most children four years old should get most of the cues correct.

Evaluation: Through observation, see if child understands the word labels asked for in the song. Secondary consideration would be the rhythm demonstrated by the child as he identifies the various parts of his body. Lack of rhythm may suggest the need for neurological examination or the need for further exercises to enhance coordination.

V. Eye-Hand Coordination

Objective: To cut out large geometrical forms (square, rectangle, triangle, and diamond) by staying within ½ inch of the line indicating their borders.

Motivation: Use paper with bright color with heavy and clear deliniation of the geometric forms. Let one child demonstrate the lesson by cutting one before the other children. (The activity of cutting has intrinsic motivational properties for young children.)

Material: Bright paper with geometric forms; scissors.

Procedure:

1. Show and have children identify the forms.
2. Explain that the task is to cut out the form keeping as close to the line as possible.
3. (Save the cut out form for a future art exercise. One possibility is to use the form as a body for an animal to which they can add other body parts made of smaller geometric forms.)

Expectation: For a group of five year olds, the expectation is that 3/4 of them should reach the objective criterion.

Evaluation: Through observation, note those who were able and those who were not able to achieve the objective. (Those who were not able to do the exercise should be assisted by being given other similar exercises to develop the skill.)

VI. External Causation

Objective: To understand the difference between how an animal is able to move as compared with a stuffed replica.

Motivation: Presence of a cocker puppy and a stuffed replica. Allow the children to first play and care for both.

Procedure:

1. Have the children talk about both, giving the similarities and differences.
2. Through the inductive approach, lead their thoughts in the direction of dealing with the question: "What causes the two to move?"

Expectation: Most children will come to see that there is an internal source of causation functioning in the live pup that does not exist in the stuffed replica.

Evaluation: Through observation and discussion assess the level of each child's understanding of the difference between them in terms of their respective sources of movement.

VII. Form Recognition and Symbolic Representation

Objective: To use different geometric forms and arrange them on background paper to resemble real objects.

Motivation: Show examples of the process. Discuss possible combinations. Perhaps take a real object and discuss the different shapes present in its total form.

Materials: Cut outs of triangles, squares, rectangles, and diamonds of various sizes; paste.

Procedure:
1. Examine objects in the classroom environment, identifying shapes that are contained in them.
2. Have children explore various possibilities before pasting them.

Expectation: Children will vary in their proficiency according to their level of functional visual acuity and experiences with both forms and spatial relationships.

Evaluation: Order the pictures in terms of their degree of accuracy. Establish a class norm based on identifiable degrees of competence.

Follow-up: Give more direction and assistance to those less proficient in doing this exercise. Some may need to attempt to replicate models done in advance by the teacher.

VIII. Constancy

Objective: To identify a triangle irrespective of size or location and circle each one.

Materials: Triangular form and triangle template.

Motivation and Procedure:

1. Have children handle and describe the triangular form.

2. Have the children to draw triangles on the board and on paper using a template.

3. Have them circle all the triangles in a picture where the triangles are imbedded.

Expectation: Most children will be able to identify 3/4 of the triangles.

Evaluation: Count the number of triangles identified and see which children reached objective criterion.

Follow-up for those having difficulty:

1. Have vision checked for functional disorders.

2. Use physical form to give children experiences in using it through building with it, painting it, etc.

3. Use templates to give children the experience of drawing the form.

4. Offer many opportunities for children to mediate their understanding of triangularity with language and body movement such as dance.

IX. Auditory and Visual Sequence

Objective: To reconstruct the sequence of a story by giving each youngster a statement telling one event in an entire episode.

Motivation and Procedure:

1. Play a tape recording which gives a sequence of episodes solely by means of sound effects.

2. Have the children identify what happened.

3. Play second tape which gives the same events but in mixed sequence.

4. Discuss the two tapes in light of the logical order of events.

5. Hand out slips of paper--one to each child--each containing one event in a story.

6. Have each child read his part when he thinks that it is next in the sequential order.

Expectation: Most children will eventually sense the logical order through group discussion.

Evaluation: 1. Have the children evaluate themselves to determine level of proficiency.

2. Through observation, assess the level of cognitive concern in figuring out the sequence rather than the level of proficiency.

X. Visual Memory

Objective: To identify successfully 9 out 12 items in a store window after three minutes of viewing.

Materials: Twelve common household items.

Motivation and Procedure: 1. Have small group of children prepare the window.

2. Tell the other children that they are preparing a game that all will participate in.

3. Appoint a time keeper, window curtain person, and a person to hear and record responses.

4. Each person will keep his own personal record and compete only with himself. (Each person's goal is to beat his previous record)

Expectation: Children will vary greatly in their ability to recall items seen in the window.

Evaluation: Use children's records to determine when they are able to reach the objective criterion. Increase the number of items for extension of the lesson.

C. Evaluation

The need for perceptual acuity is already well established.

The proposed curriculum is offered as the treatment which can develop auditory and visual acuity in children--one important beginning step in attaining learning competency. Supportive materials designed by others have been included in the program as well as the suggestion of commercially developed materials and aids listed in the Appendix which are consistent with the suggested learning experiences, and in some cases necessary for their execution. Instructional goals for the teacher are stated behaviorally so that techniques and evaluation instruments can be easily developed by the teacher to see if the objectives have been achieved. What is suggested here is that the teacher devise his own criterion measures for each learning area consistent with the developmental level of the children with whom he is working as day-to-day indications of their progress. The number of students and the objectives determine the degree to which one can adequately measure outcomes. Such testing should also be thought of as a device for facilitating, extending, and refining the teacher's observation of student achievement.

Two of the earliest tests that should be administered are tests to measure the level of organic sight and hearing. The earlier this can be done, the better. Once language is developed and basic concepts of certain configurations and their labels are learned, effective vision tests can be administered which produce reliable results. With technology improving almost hourly, new methods of assessing organic vision are being developed which do not require communication skills.

Bengt Barr and Karin Stensland Junker of Sweden have developed a test which in a very simple and effective way screens hearing contact defects in seven to nine month old babies. This test, called The Functional Contact Test for Babies, assesses functional hearing as well as organic hearing.[88] It is important to test both active sound attention as well as reception of sound vibrations since both are required in order to learn speech. At present, evaluation of the reliability and validity of this instrument is unavailable in English. However, the fact that it can reveal potential defects in organic and functional hearing makes it one test that should be recommended for trial use.

For youngsters ages 5-8, I would recommend yearly administrations of the Auditory Discrimination Test which has been developed by Joseph M. Wepman of Language Research Associates of Chicago. In this test the child is asked to judge whether or not paired-words sound the same or different. The child has to perceive fine differences between sounds and to hold them in mind long enough to make comparisons between them. This test is individually administered in oral fashion. There are forty items consisting of 3 to

---

[88] Bengt Barr and Karin Stensland Junker, The Functional Contact Test for Babies as a Screening Method (Stockholm, Sweden).

5 letter one-syllable word pairs of the consonant-vowel-consonant variety. Words comprising each pair are matched for familiarity, membership in the same phonetic category, and length. Vowel comparisons are based on parts of the tongue raised, height of the tongue, and position of the lips. Scoring instructions are clear and unambiguous.

Buros states that the test-retest coefficient is reported as .91, and that this test provides a quick and accurate assessment of auditory discrimination among children from 5 to 8 years of age. It is further stated that this test is free of contamination of performance caused by normal differences in auditory memory span. The Auditory Discrimination Test is highly recommended by Buros.[89]

I suggest the Wepman's use with the reservation that one should be aware of the cultural bias characteristic of data from it, and take that into consideration when interpreting the results. Children who have non-standard English dialect tend to not do well on this instrument.

The Bender Visual Motor Gestalt Test for Children and the Goodenough Draw a Man Test are both recommended as indices of visual perception of youngsters 4 to 8 years of age.[90]

---

[89] Oscar Krisen Buros, ed., Sixth Mental Measurements Yearbook (New Jersey), p. 1204.

[90] Ann Anastasi, Psychological Testing (New York, 1968), p. 306.

Elizabeth Koppitz along with others (J. M. Coleman, Ira Iscoe, and Marvin Brodsky) found that a child's performance on these instruments at the beginning of first grade is predictive of his level of reading at the end of the year.[91] Katrina De Hirsch, Jeanette Jefferson Jansky, and William S. Langford have stated that "the Bender Visual Motor Gestalt ranked near the top among tests that correlated significantly with end-of-second-grade achievement.[92] Furthermore, the Bender Visual Gestalt Test for Children and the Wepman Auditory Discrimination Test were both found good predictors of end-of-second-grade reading achievement and spelling.

The Bender Visual Gestalt Test for Children consists of nine simple designs presented individually on cards. The subject is then instructed to copy each design with a sample before him.

Both tests mentioned above should reveal important normative data on the comparative visual perceptual functioning of children as well as reliable predictive information regarding future achievement should their level of growth continue at its initial rate.

---

[91]Ibid., p. 306.

[92]Katrina De Hirsch, Jeanette Jefferson Jansky and William S. Langford, <u>Predicting Reading Failure</u> (New York, 1966), p. 36.

As with the Wepman, the Bender Visual Gestalt Test is not a culture free test and therefore one must be careful about drawing inferences. One has to ask the question: Is the test under consideration a good predictor of success or failure along certain lines? And, are the students expected to achieve success along those same lines? If the answers are both yes, then the instrument in question can provide a useful means for making that type of assessment.

One of the best tests developed thus far which assesses eye-motor coordination, figure fround, form consistency, position in space, and spatial relationships is the Developmental Test of Visual Perception developed by Dr. Marianne Frostig. This test is designed to measure these operationally defined perceptual functions, and to pinpoint the age at which they develop. In eye-hand coordination the child is required to draw straight and curved lines between increasingly narrow boundaries or a straight line to a specific place. In figure-ground perception, the child must discriminate between intersecting shapes and locate imbedded figures. In form constancy, the child is called upon to differentiate between circles and squares of different shadings, sizes, and positions.

For the section of the test that deals with the perception of position in space, the child is required to differentiate between figures in an identical position and those in a reversed or rotated position. The task in spatial relationships is to copy patterns by linking dots. The reviews in Buros criticise some of the vocabulary required in the directions as well as a few elements of ambiguity concerning the instruction "to draw around" as being confusing to pre-schoolers and early elementary children.

Scoring of the Frostig test is easy, clear, and efficient. Results are given in terms of grade equivalents, perceptual age, and a perceptual quotient (developmental level of the child in relation to his chronological age).

Test-retest reliability of the perceptual quotient is reported as .80.[93] In a study involving 25 students, the Frostig test proved effective in identifying children who would not attempt to learn to read when exposed to reading instruction without pressure.[94]

According to the review by Mary C. Austin, Professor of Education, Western Reserve University of Cleveland, Ohio:

---

[93] Oscar Krisen Buros, ed., Sixth Mental Measurements Yearbook (New Jersey), p. 857.

[94] Ibid.

> The Frostig test appears to be a significant one. It has proved useful as a screening tool with groups of nursery school, kindergarten, and first grade children, primarily because it permits identification of those children who need special perceptual training in five important areas of visual perception.[95]

A final visual perception test which does not carry with it the credence of those already mentioned but could be used as an interim measure between the Draw-a-Man, Frostig, and the Bender Visual Motor Gestalt Tests is the Perceptual Achievement Forms Test developed by a research committee of the Winter Haven Lions Club under the direction of Rudolph L. Kagerer. The test consists of nine geometric forms which the child is asked to replicate on 8" x 11" sheets of paper. The research team claims that the divided rectangle and the horizontal diamond were particularly discriminating in terms of visual perceptual acuity.[96]

The advantages of this test are: (1) it is easy to administer to a group; (2) the results are helpful in giving a rough notion of the progress a child is making, providing one doesn't rely too heavily on the results in terms of interpreting those results with a specificity unwarranted by the inherent limitations of the test; and (3) scoring can be done with speed and accuracy after a little practice. Results

---

[95] Ibid.

[96] Rudolph L. Kagerer, The Relationship of Visual Perception Performance in Early Grades to Reading Level in Grade Four (Winter Haven, 1960).

should be considered tentative, and corroborated with the results from more reliable and valid instruments previously mentioned.

It is suggested that the series of tests discussed above be used as fairly reliable sources for evaluating the progress of children as they are exposed to this perception enhancing curriculum. With increased knowledge and concern in this area, undoubtedly other instruments will be developed that can more effectively measure auditory and visual perception as well as provide reliable diagnostic and predictive information about the future prospects of students in terms of their potential for learning and possible achievement.

D. Summary

The need for one to be a competent learner in order to function effectively in today's society is becoming increasingly apparent. Yet there has been no evidence which would indicate that schools over the nation have taken this on as their central concern. The paucity of curricula which attempt to relate to this concern in any meaningful way is therefore understandable.

It is hoped that this curriculum for developing perceptual competency will contribute to resolving this educational dilemma. It is further hoped that this contribution will inspire other researchers to develop curricula around the other elements which comprise the significant variables of learning competency.

APPENDIX

1. <u>Equipment</u>

Novo Educational Toy &
Equipment Corporation
585 Ave of the Americas
(6th Ave)
New York, N.Y. 10011
Algonquin 5-1061 (ac. 212)

	Set #	$	Page #
Kdg. Blocks	610	62.50	2
Novo Nesting Blocks	1212	4.95	3
Lincoln Logs (210 pieces)	893	5.50	4
Playschool Village	310	5.95	4
Color Cubes	302W	3.50	4
Interlocking wooden trains freight and tug ($3.40 ea)		6.80	5
Primary pegboard	466	.85	30
Colored Pegs	467	1.75	30
Petal Craft		3.95	30
Aluminum Geometric Insert Sets	CB67	13.95	31
Busy Board		6.50	31
Shoe lacer	H065	1.10	31
Shapes	333	2.25	31
Bolt-it set	25	2.40	32
Snap blox	46	4.95	32
Bolts'n Nuts Builder	451	2.95	32

	Set #	$	Page #
Tinker toys (318 pieces)		4.95	32
Form fitter	CG740	1.95	33
Geometric Sorting Box	PL506	5.95	33
Wooden Mod Blox	5122	1.50	33
Puzzle Plaques (size 9½" x 11½")		20.00 (doz)	35
Action puppets (animals) Set of 12		15.80	42
Pick Up Sticks	8316	.95	46
Ring toss	08050	6.50	46
Balance roller (10 lbs)	510	9.50	47
Recreation tunnel	4/2C/9	9.95	49
Bag Pitch Game	66	3.95	49
Rhythm Band Outfit (Delux)		35.50	64

Milton Bradley

Geometric Figures & solids	8064	12.00	

Constructive Playthings
1040E. 85th St
Kansas City, Missouri 64131
Phone: 816-444-4711

Graded Cylinder Blocks and Knobs	TA14	28.50	61
Lingo (flowing geom-patterns can be made.)	1102	2.00	101

	Set #	$	Page #
Creative Playthings Div. of Columbia Broadcasting System Princeton, N.J.			
Vari-chimes Tower (3 lbs.)	NM923	7.95	29
Sound Cylinders (1 lb. 4 oz.)	NT608	7.95	29
Design Cubes (2 lbs.)	NT746	5.25	30
Parquetry Blocks (2 lbs. 8 oz.)	NT263	2.35	30
Wonder texture box (6 lbs. 12 oz.)	NA810	13.95	30
Pattern Learning Forms (3 lbs. 12 oz.)	NJ114	12.50	30
Magnetic Basic Form Board (2 lbs. 4 oz.)	NA817	3.00	30
Manipulation Lock Board (2 lbs. 12 oz.)	NT230	8.00	31
Hammer-Nail Design Board Set (4 lbs. 3 oz.)	NA819	8.25	31
Milkway TM Rollway (3 lbs. 10 oz.)	NR604	6.50	31
Wood Acrobats (1 lb. 8 oz.)	NB652	3.95	32
Flexagons TM (1 lb. 14 oz.)	NQ116	5.95	34
Lift-out Puzzles ($2.50 ea)	NT736 JT747	5.00	35
Learning bolts Selections 1, 2 & 3 ($8.75 ea)		26.25	39

	Set #	$	Page #
Perception Plaques Sets 1 & 2 - $3.00 ea.	NA389 NA390	6.00	40
Picture Dominos (1 lb. 4 oz.)	NE611	3.50	40
Shape Dominos (1 lb. 4 oz.)	NE612	3.50	40
Private Lines (2 lbs. 3 oz.)	NR205	7.95	40
Perception Puzzles (2 lbs.)	NE600	11.95	42
Sequence Puzzles:			
Building a House (1 lb. 5 oz.)	NE647	3.50	42
Mailing a Letter (1 lb. 5 oz.)	NE648	3.50	42
From Trees to Tables (1 bl. 5 oz.)	NE649	3.50	42
Milk Production (1 lb. 5 oz.)	NE650	3.50	42
Jumbo Additive Blocks & Board- (11 lbs.)	NJ095	10.00	67
3 Dimensions Parquetry (1 lb. 8 oz.)	NE610	6.95	68
Sum Stick (1 lb. 2 oz.)	NJ017	4.95	69
Crawligator (2 lbs. 12 oz.)	NE200	7.95	103
Clutch Bell (14 oz.)	NQ486	2.00	103

2. <u>Glossary</u>

Balance beam:	Eight foot board 2" x 4" with end supports.
Balance board:	Board 16" square with 3, 4, cr 5" block centrally located underneath.
Buckle board:	Board with a belt buckle attached.
Busy box:	A board with various manipulative devices (crank, drawer, phone dial, sliding door, etc.) which can be attached to a crib or play pen.
Buttoning board:	Board with a coat front attached.
Crib aquarium:	Plastic bag with fish, shells, etc. that can be hung above the crib.
Crib pulley:	A pulley device that can be attached above the crib.
Hula hoop:	Large plastic hoop approximately 3-4 feet in diameter.
Looney links:	Interlocking plastic sections.
Pogo stick:	A pole like toy with foot supports 2' from the bottom and a spring supported section at the bottom which gives under pressure allowing the youngster to bounce up and down.
Shoe lacing board:	Board with a shoe attached.
Zipper board:	Board with a zipper attached.

BIBLIOGRAPHY

1. Books

Allport, J. H. Theories of Perception and the Concept of Structure. New York: Wiley and Company, 1955.

Anastasi, Ann. Psychological Testing. New York: The Macmillan Company, 1968.

Anderson, Richard C. and Ausubel, David P. Readings in the Psychology of Cognition. New York: Holt, Rinehart and Winston, Inc., 1965.

Ausubel, David P. Theories and Problems of Child Development. New York: Grune & Stratton, Pub., 1965.

Baldwin, A. L. Behavior and Development in Childhood. New York: Dryden, 1955.

------. Theories of Child Development. New York: John Wiley and Sons, 1967.

Barr, Bengt, and Junker, Karin Stensland. The Functional Contact Test for Babies as a Screening Method. Stockholm, Sweden: Lekoteket På Blockhusudden

Baruch, Ray. Enriching Perception and Cognition. Seattle, Washington: Special Child Publications, Inc., 1968.

Bruner, J. S. "Personality Dynamics and the Process of Perceiving" in Perception: An Approach to Personality. New York: Ronald Press, 1951.

------, Olver, Rose R., and Greenfield, Patricia M., et al. Studies in Cognitive Growth. New York: John Wiley and Sons, Inc., 1956.

Buros, Oscar Krisen, ed. Sixth Mental Measurements Yearbook. New Jersey: The Gryphon Press, 1965.

De Hirsch, Katrina, Jansky, Jeanette Jefferson, and Langford, William S. Predicting Reading Failure. New York: Harper and Row, Publishers, 1966.

Deutsch, Cynthia P. "Environment and Perception," in Social Class, Race, and Psychological Development, eds. Martin Deutsch, Irwin Katz, and Arthur R. Jensen. New York: Holt, Rinehart, and Winston, Inc., 1968.

------. "Learning in the Disadvantaged," in The Disadvantaged Child, ed. Martin Deutsch and Associates. New York: Basic Books, Inc., 1967.

Dröscher, Vitus B. The Magic of the Senses. New York: E.P. Dutton and Co., Inc., 1969.

Earley, George H. Perceptual Training in the Curriculum, ed. Dr. Newell C. Kephart. Columbus, Ohio: Charles E. Merrill Publishing Co., 1969.

Fantz, Robert L. "Pattern Discrimination and Selective Attention as Determinants of Perceptual Development from Birth," in Perceptual Development in Children, eds. Jeanne L. Rivoire and Aline H. Kidd. New York: International Universities Press, Inc., 1966.

Frostig, Marianne, and Horne, David. The Frostig Program for the Development of Visual Perception. Chicago: Folette Publishing Company, 1964.

Gardner, D. Bruce. Development in Early Childhood - The Pre-School Years. New York: Harper and Row, Publishers, 1964.

Getman, G. N., Kane, Elmer R., Halgren, Marvin R., and McKee, Gordon W. Developing Learning Readiness, A Visual--Motor--Tactile Skills Program. New York: Webster Division, McGraw-Hill Book Company, 1968.

Gibson, James J. "Social Psychology and the Psychology of Perceptual Learning," in Group Relations at the Cross-roads, eds. M. Sherif, and M. O. Wilson. New York: Harper, 1953.

------. The Senses Considered as Perceptual Systems. Boston: Houghton Mifflin Company, 1966.

Goins, Jean Turner. Visual Perceptual Abilities and Early Reading Progress. Chicago: The University of Chicago Press, 1958.

Goldstone, Sanford, and Goldfarb, Joyce Levis. "The Perception of Time," in Perceptual Development in Children, eds. Aline H. Kidd, and Jeanne L. Rivoire. New York: International Universities Press, Inc., 1966.

Harlow, H. F. "Primary Affectional Patterns in Primates," American Journal of Orthopsychiatry. 1960.

Hartup, Willard W. "Nurturance and Nurturance Withdrawal in Relation to Dependency Behavior of Pre-School Children," Readings in Child Behavior and Development, ed. Celia Burns Stendler. New York: Harcourt, Brace and World, Inc., 1964.

Hebb, Donald O. A Textbook of Psychology. Philadelphia: W. B. Saunders Company, 1968.

Hilgard, E. R. "The Role of Learning in Perception," in Perception: An Approach to Personality, eds. R. R. Blake and G. V. Ramsey. New York: Ronald Press, 1951.

Jordan, Daniel C. Blueprint for Action: A Summary of Recommendations for Improving Compensatory Education in Massachusetts. Amherst, Mass., 1970.

Kagerer, Rudolph L. The Relationship of Visual Perception Performance in Early Grades to Reading Level in Grade Four. Winter Haven: Winter Haven Lions Publication Committee, 1960.

Katz, D. Gestalt Psychology. New York: Ronald Press, 1950.

Kidd, Aline H., and Robert M. "The Development of Auditory Perception in Children," in Perceptual Development in Children, eds. Jeanne L. Rivoire and Aline H. Kidd. New York: International Universities Press, Inc., 1966.

Maccoby, Eleanor E., and Zelner, Miriam. Experiments in Primary Education--Aspects of Project Follow-Through. New York: Harcourt Brace Jovanovich, Inc., 1970.

Maier, Henry W. Three Theories of Child Development. New York: Harper and Row, Publ., 1965.

Oliver, Rose, and Hornsby, Joan Rigney. "On Equivalence," in Studies in Cognitive Growth, eds. Jerome Bruner, Rose R. Oliver, and Patricia M. Greenfield, et. al. New York: John Wiley and Sons, Inc., 1956.

Piaget, Jean. The Construction of Reality in the Child. New York: Basic Books, Inc., 1954.

------. The Mechanisms of Perception. New York: Basic Books, Inc., 1969.

Rivoire, Jeanne L., and Kidd, Aline H. "Perception of Color, Space, and Movement in Children," in Perceptual Development in Children, eds. Jeanne L. Rivoire, and Aline H. Kidd. New York: International Universities Press, Inc., 1966.

Robbins, Melvyn Paul. The Delacato Interpretation of Neurological Organization - Ab Empirical Study. Chicago: University of Chicago, 1965.

Robot, T. The Psychology of Attention. Chicago: Court Publishing Company, 1911.

Salt, E. Benton, Fox, Grace I., and Stevens, B. K. Teaching Physical Education in the Elementary School, New York: The Ronald Press Company, 1960.

Segall, M. H., Campbell, D. T., and Herskovitz, The Influence of Culture on Visual Perception. Indianapolis: Bobbs-Merrill Company, 1966.

Solley, Charles M., and Murphy, Gardner. Development of Perceptual World. New York: Basic Books, Inc., 1960.

Stagner,R., and Karwoski,T. Psychology. New York: McGraw-Hill, 1952.

Stendler, Celia Burns. Readings of Behavior and Development. New York: Harcourt, Brace and World, Inc., 1964.

Von Senden,M. "Raum und Gestaltauffassung bei Operierten Blindgeborener von und nach der Operation," Lupzig: Barth 1932. Cited by D.O. Hebb; the Organization of Behavior. New York: Wiley and Sons, Inc., 1949.

Wapner, S., and Werner, H. Perceptual Development: An Investigation Within the Framework of Sensori-tonic Field Theory. Worcester: Clark U. Press, 1957.

Wisdom of China and India. Ed. Lin Yutang. Random House, Inc.,1942

Woodworth, R. S. Experimental Psychology. New York: Holt, 1938.

Zeaman, D., and House, B. J. An Attention Theory of Retardate Discrimination Learning. Progress Report #3 (Research Grant M-1099). Bethesda, Md.: National Institute of Mental Health, 1962.

2. Journal Articles

Bruner, J. S., and Goodman, C.C. "Value and Need as Organizing Factors in Perception," Journal of Abnormal Social Psychology, XLVII (1947).

Clark, Ann D., and Richards, Charlotte J."Auditory Discrimination Among Economically Disadvantaged and Non-Disadvantaged Pre-School Children," Exceptional Children, (December 1966).

Deutsch, Cynthia P. "Auditory Discrimination and Learning Social Factors," Merrill-Palmer Quarterly, X (1964).

Dennis, W. "Causes of Retardation among Institutionalized Children," Journal of Genetic Psychology, XCVI (1960).

Ellis, H. C., and Muller, D. G. "Transfer in Perceptual Learning Following Stimulus Predifferentiation," Journal of Experimental Psychology, LXVIII (1968).

Erikson, Erik, and Erikson, Joan. "The Power of the New Born," Mademoiselle, (June 1953).

Gellhorn, E. "Physiological Processes Related to Consciousness and Perception," Brain, LXXVII (1954).

Hebb, D. O. "The Motivating Effects of Exteroceptive Stimulation," American Psychologist, XIII (1958).

Hernandez-Peon, R., Scherrer, H., and Jouvet, M. "Modification of Electric Activity in Cochlear Nucleus During 'Attention' in Unanesthetized Cats," Science, CXXIII (1956).

Hubel, D. H., Henson, C. O., Rupert, A., and Galambos, R. "Attention Units in the Auditory Cortex," Science, CXXIV (1959).

Morruzzi, G., and Nagoun, H. W. "Brain Stem Reticular Formation and Activation of the E.E.G.," E.E.G. and Clinical Neurophysiology, I (1949).

Solomon, R. L., and Wynne, L. C. "Traumatic Avoidance Learning: The Principles of Anxiety Conservation and Partial Irreversibility," Psychology Review, I (1954).

Werner, H., and Wapner, S. "Toward a General Theory of Perception," Psychology Review, LIX (1952).

White, B. L., Castle, P., and Held, R. "Observations on the Development of Visually-directed Reading," Child Development, XXXV (1964).

Woodworth, R. S. "Reinforcement of Perception," American Journal of Psychology, LX (1947).