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ABSTRACT

The purpose of this individualized perceptual skills curriculum is to ensure that each child acquires facility in processing concrete information before being exposed to abstraction demands of an academic program. The four major curriculum areas described are general motor, visual motor, auditory motor, and integrative. Unit areas are defined, behavioral objectives described, tests prepared to assess those objectives, and teaching strategies suggested for behavior not yet achieved. (Author/ED)

THE DESIGN OF AN INDIVIDUALIZED PERCEPTUAL SKILLS CURRICULUM

by

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THE DESIGN OF AN INDIVIDUALIZED PERCEPTUAL SKILLS CURRICULUM

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Purpose

The purpose of a perceptual skills curriculum is to insure, insofar as possible, that each child acquires facility in processing concrete information before he is exposed to the abstraction demands of an academic program. Virtually all educational models assume that the student has achieved a prerequisite, albeit minimal, degree of academic readiness which, in turn, implies the presence of these processing skills. Educators are aware that chronological age is not a secure criterion for the judgment of such readiness. There has been increasing realization in recent years that, despite its obvious importance, mental age, as assessed by standardized methods, cannot be viewed as the sole determinant of a child's ability to profit from a program of academic instruction.

Resnick (1967) has written concerning the need for the design of an early learning program "explicitly intended to teach children how to learn and how to think -- in other words, to teach the skills and concepts that underlie intelligent behavior." Among the general classes of skills which she identified for inclusion in an early learning curriculum was the "perceptual." Piaget (1960), Bruner (1967) and others also have acknowledged the role of sensory-motor development as a foundation for the higher-order cognitive processes. This paper proposes that those important perceptual *skills can be identified, described in behavioral terms and taught. It further proposes that the instruction may be individualized so as to serve each child's specific needs.*

Perception, in this context, refers to the dynamic act of extracting concrete information from one's environment through the effective utilization and integration of the intact sensory receptors. In short, it is the process that enables the child to attach structure -- organized form -- to raw sensory data.

The obvious initial task in designing such a curriculum is to define the perceptual skills requirements of a typical first grade program. What concrete information processing abilities are assumed in the lesson plans of a primary program? Successful classroom performance at that level appears to be dependent upon the child's capacity to perform certain specific tasks. He must be able to decode visual information and demonstrate his comprehension of its construction by an encoding response employing pencil and paper. He also must be able to decode auditory information and demonstrate his comprehension of its construction by an encoding response employing his own vocal mechanism. Ultimately, he must demonstrate efficient intersensory integrative skills, such as representing visual information in verbal form as well as auditory information in visual (graphic) fashion. Lacking these skills, academic achievement will be difficult indeed. In addition, the child should be prepared to perform these processes without excessive conscious effort so that they may serve as efficient subskills to the higher order cognitive functions. The inebriate may very well be able to "walk the white line"; but, at what personal *expense in terms of effort and constriction of processes? Similarly, the child whose printing and/or speech articulation skills reveal immature, global characteristics, who persists in confusing the "b" and the "d," w consistently "loses his place" on the page, who is incapable of basic auditory discriminations or attending to and remembering a short sequence of simple spoken instructions, will have little time and energy to devote to such tasks as concept formation. Perhaps he "can do better if he tries," but at what price -- and, for how long?*

Rationale

A consistent rationale was followed in designing the curriculum described here. In essence, the rationale accepts the premise that a child's ability to analyze, order and reproduce concrete information is not innate. Rather, these are a series of acquired skills which are dependent upon the integrity of the child's biological systems and the richness of his sensory-motor development as shaped by interactions with his environment. Discussion concerning the relative importance of nature versus nurture is moot and irrelevant. Both appear to be important and inextricably interwoven. The young child's overt motor explorations -- initially reflex driven, eventually purposeful -- are a vital factor in his learning to process sensory information in a reliable, systematic fashion. They provide him with a tangible, though initially imprecise, means for matching what he sees and hears with what he feels, tastes and smells. As increased articulation of body concept develops, as the child physically explores his visual and auditory spatial domains more precisely, his visual and auditory processes also reflect more discrete *qualities. The need for overt motor involvement in the analysis of sensory stimuli diminishes and is eventually replaced by covert implicit representations of these motor acts. Hence, the very young child's sensory-motor processes rely heavily upon the motor component of the act. As the sensory inputs become more meaningful and the motor component is internalized, information processing becomes more efficient. The diagram below attempts to represent that shift graphically:*

sensory-MOTOR → [*Growth and Development*] → *SENSORY-motor*

It is proposed, then, that perceptual efficiency is in inverse proportion to the degree of motor involvement required of the perceiver. (The term "perceptual-motor," though currently popular, is redundant. The single word "perceptual" acknowledges a motor as well as sensory component.) Improved efficiency enables the child to process larger units of concrete information, embedded in increasingly "noisier" contexts, with less energy expenditure. The word <u>*process*</u> *is critical. Typical academic curricula focus upon content and the transmission of concepts necessary to grasp certain defined abstractions. A perceptual skills curriculum, in contrast, is devoted to teaching process -- the ability to analyze and synthesize the concrete information contained within the lessons. Miller (1956), in describing "recoding," presents the analogy of the novice radio-telegraph operator who, at first, hears each dot and dash as a separate "chunk." As he learns, he is able to organize these isolated sounds into letters and deal with the letters as larger chunks. Subsequently,* the letters are grouped into even larger chunks, as words, and so on. Following this analogy, the first task of the child -- almost always assumed, not always present -- is to be aware of the elementary isolated chunks. If he can perform this analysis, he may then develop the capacity to recode -- process larger chunks -- which is indicative of improved efficiency and essential for appropriate classroom performance. The child who has not acquired the ability for differentiated processing is in academic trouble from the beginning. The child who has achieved this capacity but depends heavily upon overt motor involvement in performing the analysis of the elementary chunks is at almost as much of a disadvantage. His ability to recode -- to group the isolated bits into larger units -- will be so slow as to be impractical for satisfactory classroom performance.

Another characteristic of perceptual processing differentiates this curriculum from the typical academic program. Most children acquire appropriate perceptual skills as a result of normal growth and development. Hence, whereas virtually all children must be literally taught to read and to manipulate number concepts, many will not require formal instruction in the processing of concrete visual and auditory information if they are given sufficient time and opportunity to develop them. A perceptual skills curriculum, therefore, must provide some means for determining the presence or absence of these expected abilities and effective methods for teaching them when so indicated. The alternative approach -- one not generally received with favor today -- is to allow the child additional time to "grow out" of his difficulty; that is, to mature. If this curriculum achieves its goal of individualization, there will be no need for such an approach. It also provides the opportunity for investigating what, if any, benefit may be derived from attempting to assist children in the establishment of perceptual skills that are in advance of normal expectations; that is, can a headstart, in the actual sense, be provided?

Design

Both IPI (Bolvin and Glaser, 1968) and PEP recognize the uniqueness of each child's experiential background and existing level of competency. The respective curricula of these projects reflect this in their attempt to offer a program of study tailored to individual differences based upon a careful analysis of the components involved in achieving mastery of specific educational goals. That philosophy has been applied to the teaching of perceptual skills. Once having defined the perceptual skills which appear to be prerequisite to satisfactory first grade performance, an analysis of the components involved in those behaviors was undertaken. As described in the design of the PEP curriculum (Resnick, 1967), each stated behavior defined by component analysis was stated as an objective within the curriculum. Over 200 objectives have been described thus far. These were grouped into four major areas and sequentially ordered within each area. The resultant hierarchy of the behavioral objectives reflects the stated rationale in that there is a diminishing dependency upon overt motor support in the manipulation of sensory information as one proceeds up the developmental continuum.

The four major curriculum areas are: General-motor, Visual-motor, Auditory-motor and Integrative. A criterion-referenced (as contrasted to norm-referenced) test was written for each behavioral objective, again following the PEP format (Wang, 1969). Most, if not all, existing tests designed to assess perceptual development are norm-referenced. That is, they allow for the comparison of the subject's performance to a general population of similar age. The tasks presented in the usual norm-referenced perceptual tests are intended as measures of the child's ability to demonstrate a generalized, rather than a specific, skill. For example, a test involving the copying of a geometric shape -- such as a triangle -- is meaningful only if the child has not been taught specifically to draw that shape. Teaching the child the "answers" to norm-referenced tests destroys the meaningfulness of the test results. On the contrary, criterion-referenced tests are constructed so that the "answers" may be taught. Thus the teacher can readily determine each child's degree of competency within each curriculum area by testing for the presence of specific behaviors. Testing the terminal objective within each grouping may then serve as a placement test. If the child can demonstrate mastery of that terminal objective, and if the hierarchy of objectives is valid, he has, by inference, achieved mastery of all of the supporting behaviors. On the other hand, if he cannot demonstrate mastery of the terminal objective, the educational task becomes one of determining the level at which teaching should begin. This may be accomplished by pre-testing objectives at specific levels within the hierarchy and teaching to those behaviors which have not yet been achieved. As the child learns and moves through the sequence, post-tests are used to monitor his mastery of the defined behavioral objectives. This organization offers the teacher a precise method for tracking each pupil as well as allowing for specific instructional strategies for each objective. Both are powerful aids in managing an educational program devoted to so complex a lattice work of interrelated behaviors as is perception.

The General-motor area is concerned with testing and, where indicated, teaching gross and fine motor skills. Fine motor skills, as described in this curriculum, include not only the child's very important digital manipulation abilities but also his ability to display discrete control of the oculo-motor and vocal mechanisms. The rationale of the curriculum acknowledges that, in effect, the child's general motor actions, and especially his hands, "teach" his eyes the organizational skills required for the ordered manipulation of visual space and vice versa. It also accepts the similar premise that the development of synchronous, bilaterally integrated body movements, combined with vocal operations, "teach" his ears the organizational skills required for the ordered manipulation of auditory space and, again, vice versa. Hence, the more articulate these motor skills, the more refined the sensory process will be.

The Visual-motor area focuses upon the child's ability to analyze, order and reproduce concrete visual information of increasing complexity. Various manipulative devices, including pencil and paper tasks, are used in testing and, when needed, teaching. As stated above, in no instance is an objective concerned with a drawing of a specific geometric shape. Rather, the objectives have been written to assure the teacher of the child's generalized ability to organize visual information with a diminishing need for external support.

The Auditory-motor area reflects these same concerns as related to organization of verbal and non-verbal information received exclusively by the ears. For example, the child is tested as to his ability to identify specific sounds, non-verbal as well as certain phonemes, embedded in contexts of increasing complexity. As is the case throughout the curriculum, the teacher is provided with suggestions for teaching strategies to be implemented when indicated by the child's responses to the tests.

The Integrative area, as the name implies, devotes attention to the child's ability to relate information received by more than one perceptual system. For example, the ability to name as well as execute the letters of the alphabet is a concern of this area. In effect, the intersensory integrative objectives are the pre-reading skills from which is derived the ability to relate grapheme and phoneme.

One additional consideration must be discussed. The design of this curriculum is intended to provide the teacher with a means for individualizing her assessment and teaching efforts. Each child, in effect, will plot his own unique developmental profile which, in turn, will indicate whatever intervention methods may be required. No academic curriculum, however, has yet been designed which serves all children equally effectively. Logically, it may be anticipated that a certain -- hopefully limited -- number of children will demonstrate persistent perceptual dysfunction despite all reasonable efforts to the contrary. No attempt will be made to identify specific causal factors in those situations other than ruling out auditory and visual acuity deficits as routinely provided by school health programs. It would be advantageous to provide some means for assessment of the child's functional visual skills but, until vision specialists are routinely available within the school setting, this area cannot be included in a curriculum. It belongs to the specially trained professional who can assess and administer intervention programs directly related to ocular functions. It is an important area in that, through achieving the ability to order and manipulate three-dimensional visual space, the child can perform the visual tasks of the classroom more efficiently. Intervention, however, usually requires the use of certain devices -- lenses and prisms -- which are beyond the training of the classroom teacher. The teacher must be allowed to retain the role she has been professionally prepared to assume. To designate her in a clinical role -- as in a medical model -- can only serve to confuse and ultimately, in most cases, divert her from the primary duties of teaching. In situations where dysfunction persists, despite intervention, if individualization truly is a concern, there is at least one obvious alternative strategy. By making use of the child's perceptual profile the teacher could, with proper preparation, design the instructional situation so as to accommodate the perceptual deficits and teach to his strengths. As one obvious example, she could use spoken communication almost exclusively with the child who displays a severe visual-motor deficit. Granted, efforts should continue towards habilitation of the inadequate function but, in the interim, the child could be spared the traumatic experiences of continued failure. This is not a radical suggestion. It is a modification of the accepted approach for teaching the blind and the profoundly deaf.

Curriculum Areas

It is an obvious oversimplification to categorize perceptual behaviors in single modalities, but it is necessary to do so for the purposes of organizing the program into a useful device. It also is an oversimplification to avoid consideration of the other sensory receptors -- i.e., taste and smell -- which provide the very young child so much concrete information about his environment. Two perceptual systems -- the visual and auditory -- are the most vital to academic performance; hence, they are the systems to which primary attention will be devoted.

General-motor: As stated earlier, the broad goal of this curriculum area is to provide the child with the experiences indicated as necessary for the development of appropriate gross and fine motor skills. Implicit in this goal is the awareness that attainment of such motor skills also indicates the development of an organized, articulated body concept. This in turn provides the child with two basic capacities related to efficient perceptual processing. It provides him with the mechanism for physically exploring his environment in an increasingly refined manner to which he can relate sensory inputs; it serves, as well, as the orientation base from which spatial relationships are eventually to be understood.

Over 100 years ago, Seguin (1907) recognized some relationship between motor function and cognition. Montessori (1964), Gesell (1952) and others also have written concerning the interrelationship of these two seemingly diverse components of human behavior. Kephart (1960) has demonstrated that the child's ability to perceive his space world becomes *more discrete as he learns to manipulate his body in a similarly differentiated style. That is, as his ability to move his body in a coordinated, self-directed fashion improves, the child's understanding of the simultaneously received proprioceptive, haptic, visual and auditory data becomes more refined. His perceptual style, then, will reflect a more analytical approach to information processing. Witkin (1968) has effectively demonstrated this relationship in his studies of one's ability to respond to context-embedded information in a field-dependent versus independent manner.*

The research concerning human spatial orientation related to the U. S. space program has provided much pertinent information concerning sensory-motor function (Howard and Templeton, 1966). From the moment of conception, the most consistent force prevailing upon the human organism -- and the most important as it relates to spatial orientation -- is gravity. This constant force provides the child with a reference point for the rudimentary spatial orientation skills he displays as a neonate. He feels "up" and "down" long before he can express the knowledge in any language form. As he hears "up" and reaches "up," he commences to accumulate the sensory-motor experiences which eventually will enable him to appreciate "up" and "down" from sensory information alone. From this basic egocentric locus, he will match the inputs derived from movement, such as to one side or the other, forward, behind, etc., with that data received through the auditory and visual channels. As his motor exploratory skills become more elaborate, so too will his ability to organize his spatial domain become more intricate.

His reach and grasp, for example, will become more precise -- not only because his ability to localize the stimulus -- visually and/or auditorally has become more accurate but, rather, because the sensory and motor acts establish an interacting, circular reaction. His motor skills reflect his more accurate sensory capacities which, in turn, heighten his motor skills even further. As his ability to move purposefully increases, he will explore the further reaches of his spatial domain and, thereby, expand the effective limits of that domain. He will commence to display an understanding of the relationship between his house, a neighboring one, and beyond. Eventually, his spatial localizations will become less egocentric and will display comprehension of spatial relationships as though seen from other viewpoints.

Simultaneously, in this elaboration of human development, he will start to appreciate that his two body sides, although very similar, are different. To the young child, extending the right hand to the right is merely a movement away from self and very little different from extending the left hand to the left. Continued development should lead to the determination of a motor-preferred side. Again, a circular reaction is effected in that increased use of one body side will tend to produce more sophisticated movement skills from that side which will, in turn, cause him to use that side more consistently. Complete bilateral symmetry is a deterrent to the initiation of action. The human organism is a "multistable, dynamic, integrated mechanism" (Harmon, 1958), constantly seeking, but never achieving, static equilibrium. The determination of a consistently preferred side allows for an understanding of laterality which, when projected into external space, yields a reliable comprehension of directionality and such language labels as "left" and "right."

Seven unit areas thus far have been defined as descriptive of the developmental continuum of general-motor skills. Behavioral objectives have been described within each unit and tests prepared to assess them. Teaching strategies are suggested for those behaviors which have not yet been achieved.

The behavioral objective units are:

Unit I - Balance (Stationary). This unit presents tests for such objectives as the ability to balance on either foot.

Unit II - Balance (Mobile). A typical objective tested within this unit is the child's ability to hop on either foot.

Unit III - Combination of Gross Motor Processes. Among others, the child's ability to skip is probed.

Unit IV - Fine Motor (Facial). Characteristic of this unit is a concern regarding the child's ability to manipulate his tongue, teeth and lips in a coordinated, directed manner. Eye movements, too, are investigated.

Unit V - Fine Motor (Digital). This unit presents tests for such objectives as lacing a shoe and tying a bow. The importance of these refined skills as related to effective visual-motor function has been mentioned and will be discussed in greater depth later in this paper.

Unit VI - Body Awareness. This unit acknowledges the importance of insuring that the child is aware of his general body organization and will provide tests to measure its presence.

Unit VII - Laterality. *This unit contains objectives designed to probe the child's awareness of the similarities and differences between his two body sides as well as his bilateral coordination skills.*

In summary, the general-motor area of this curriculum accepts the premise that the components of organized motor skills can be analyzed, defined, tested and taught. It further acknowledges that these behaviors assist the child in learning to perceive his environment in an organized fashion and, as such, will provide a base for the acquisition of the more efficient, higher order cognitive skills.

Visual-Motor - The general goal of this curriculum area is to test and, when necessary, teach the child one or more methods for analyzing, ordering, and reproducing visual information. Traditional probes into this function make use of norm-referenced copying tests, such as the Gesell Developmental Forms (Ilg and Ames, 1964) and the Rutgers Drawing Test (Starr, 1961). The question asked by such tests is, essentially: Can the child copy such shapes as a circle, cross, square, triangle, diamond, etc.? Does the child appreciate the interrelationships of the parts that combine to produce the various geometric forms he is asked to copy? It has long been known that certain geometric shapes are appreciably more difficult to copy than others (e.g., the diamond in comparison to the circle). Visual discrimination tests which require matching to sample or designation of oddity are not of sufficient depth for our purposes. Children frequently will demonstrate the ability to perform successfully under such testing conditions despite an inability to reproduce those *designs with pencil and paper. In contrast to these traditional probes, the defined curriculum objectives do not require the copying of specific, norm-referenced geometric forms. Rather, they describe behaviors which, if properly achieved, indicate that the child has learned a process that can be generalized in any reasonable copying task. Thus, he will not be taught specifically to draw a triangle or a diamond but, more importantly, he will be taught the processes needed to copy those, as well as other forms, accurately. Jensen (1969) has stated that "the child of five who has been taught to copy the diamond seems to have learned something different from what the seven-year-old 'knows' who can do it without being 'taught'. Though the final performance of the five-year-old and the seven-year-old may look alike, we know that the cognitive structures underlying their performance are different." This curriculum approach disagrees with that statement. It is our belief, based on strong empirical evidence, that the "cognitive structures underlying their performance" can be identified and taught to the five-year-old, if properly presented.*

The typical first-grade program requires that the child not only identify but also copy the alphabet. The alphabet is composed of a series of orthographic symbols constructed by combining an assortment of shapes in a variety of arrangement. Though the differences are obvious to the adult, these discrete interrelationships often confuse the unsophisticated first-grade child. For example, the "circle" and "line" are used for constructing the letters: a, b, d, p, q. *All contain similar components but in different arrangements. The child must appreciate these refined differences and learn to recognize and reproduce the letters as* *larger recoded chunks having specific unit values. If the task is overly challenging, if he must "draw" the letters processing one "bit" at a time, he will have little opportunity to devote attention to the abstractions required by the academic program -- that of relating a verbal label and a phonetic representation to the visual symbol, as well as combining symbols to construct words.*

Similarly, mathematical concepts demand an understanding of specific spatial relationships. Arabic numerals and their verbal designations have little meaning to the child if the abstractions are not supported by an understanding of the concrete base upon which these are built. Verbal labels, such as "one," "two," and "three," as well as the visual symbols "1," "2," and "3," are appreciated when the child can grasp the concrete interrelationships that exist between these designations. When the child can see, feel and even hear (and demonstrates that appreciation by some construction) that "two" means twice as many, as large, as long, as wide, as high, and so forth, he will be more readily able to understand the abstract relationship between the visual symbols "1" and "2". Rote counting may be a predecessor to learning mathematics but it is not of major value in isolation.

The capable visual-motor performer views visual information and analyzes the interrelationship of its parts. Given a copying task, he chooses a point of origin and reproduces the individual segments as he has analyzed them. In effect, an "imagined" or internalized spatial coordinate grid -- a matrix -- is superimposed upon both the viewed stimulus and the blank paper on which he draws. The eyes perform the task of analysis.

The general-motor involvement, no longer required, has been internalized. His hands have "taught" his eyes this analytical function in previous experiences. If they have been well taught, the eyes will perform the required analysis more rapidly and with less effort devoted to the individual segments. The importance of Unit V of the general-motor curriculum area (fine motor-digital) should be apparent here. If the hands do indeed teach the eyes to analyze visual information, the importance of refined finger skills is obvious. Lacking such skills would be comparable to exploring with hands that are wearing mittens. An awareness of refined detail would be absent, and the visual processes would reflect these global qualities.

Given a sufficiently complex visual stimulus, overt motor participation may be required even of one whose skills ordinarily are adequate. The perceiver may find it necessary to use his hand as a "pointer" for the support needed to perform the analytical component of a complicated visual task. Internalized language -- not usually observable -- also may demonstrate this. When asked to describe the analytical process involved, the capable performer may use such terms as "above," "to the right," "one-half," and "between," in his description of existing spatial relationships, again indicating an internalized motor involvement which has been translated into representative language.

Six units, thus far, have been designated as properly descriptive of the developmental continuum of visual-motor skills. Behavioral objectives have been described within each unit and tests constructed to assess them. As in all curriculum areas, teaching strategies are suggested for those behaviors which have not been achieved.

Unit I - Superimposition. The behavioral objectives within this unit are concerned with the child's ability to superimpose matching objects over a concrete visual model. Materials offering increasing degrees of complexity are used, such as one-inch cubes, parquetry blocks and Design Boards (Rosner, 1969).

Unit II - Construction of a Concrete Arrangement From a Model. The behavioral objective tests of this unit probe the child's ability to construct concrete arrangements which exactly match an existing model.

Unit III - Construction of a Concrete Arrangement From an Abstract Representation. This unit requires the child to produce a construction, using various media, from a drawn representation. It may be compared to the task which faces the builder who must interpret the architect's schematic drawings. An organizational matrix is constantly present to provide support for the child.

Unit IV - Production of an Abstract Representation From a Concrete Model. This unit requires the child to produce a drawn representation of a concrete construction. Again, as in the earlier described units, supporting spatial coordinates are provided so that the child has a consistently reliable method for confirming his visuo-spatial judgments. Extending the analogy presented above, this is analogous to the task that faces the architect who, having been shown a completed construction, is required to draw a scaled representation of it. It also may be compared to the cartographer who, given the established coordinates, represents the information upon that matrix.

Unit V - Concrete to Abstract (Fading of Support). As the heading implies, the tests of this unit probe the child's ability to demonstrate the skills of Unit IV, but with a diminishing amount of support. He must "imagine" the location of the various spatial coordinates which originally provided him assistance in the analysis and reproduction of the test patterns. In some ways it may be likened to the task of writing on unlined paper, having always previously used paper on which horizontal lines were printed. It approximates the basic conditions of the usual copying task. The goal, however, is not to teach the child to copy a specific shape or arrangement of shapes but, rather, the generalized skill of viewing and reproducing visual information in an organized, reliably accurate manner.

Unit VI - Reordering a Visual Information. This unit tests the child's ability to appreciate size and shape constancy from alternative viewpoints. It questions the child's capacity to organize larger "chunks" of visual information and to view the information in alternative organizations. Having achieved this capacity, the child may, in processing a problem, select that viewpoint which best serves his needs.

Auditory-Motor - The general goal of this curriculum area is to test and, if indicated, teach the skills required for the analyzing, ordering and reproducing concrete auditory information. Auditory perceptual skills are most essential to the school child in meeting the academic demands that typically confront him in an elementary curriculum. It is upon this ability to process verbal auditory information that his language development is based -- and vice versa.

The visual world of the human is a relatively ordered one even if his own perceptual skills are lacking in proficiency. Our architecture, our time system, our furniture, virtually our total environment reveals the inherent order of visual space. This printed page demonstrates the organized presentation of visual information. There are spaces between words, capital letters initiate sentences, periods terminate sentences, and so on. In addition, ordinarily that which is being visually explored remains in place; an unreasonable time limit is not necessarily imposed upon the viewer.

Consider the child whose auditory-motor skills are substandard. His basic difficulty is that of analyzing and ordering auditory information. Hence, the very simple and common command: "Please open your book to page twenty" may be perceived by the child whose auditory perceptual skills are inappropriately global as: "pleaseopenyourbooktopagetwenty". Much of the external support that is provided the child in his visual world is lacking in the auditory. Those generating the auditory stimuli may or may not speak with the "spaces" between the words. Certainly, it is the rare, extremely pedantic individual who speaks this way to any extensive degree. Also, the time available to the listener is extremely limited. Sound is temporal. It does not stand still and allow for exploration. Once transmitted it is gone. It can be heard again only if generated again or if recorded on a device that allows replay.

One of the most trying tasks which the child must face is that of coping with individual speaking styles and, even worse, with the varying styles which any one individual can display. There are a limited number of type-faces used in the child's book. Consider the limitless variety of speaking styles which the child must attend to and interpret. There are times when his teacher speaks slowly and distinctly in short, concise sentences. In contrast, there may be times when his teacher speaks rapidly, less distinctly or in extended sentences. Between these two extremes are many other possibilities. The child must be capable of receiving, analyzing and ordering this flow of sounds if he is to store and/or use the information contained within those sounds. To complicate matters, some of the vocabulary may be unfamiliar to him. His task, then, becomes more difficult and perhaps even impossible. He may be accused of "not listening" when, on the contrary, he is listening very intently but not making any sense out of what is being heard because of his inability to organize the information -- to put the "spaces" between the words. Most first grade and kindergarten teachers can recall the children in their classes who demonstrated the encoding aspect of this problem in the way those children recited the "Pledge of Allegiance" or some other grouping of words learned by rote.

As with all other perceptual systems, the child's early processes in the manipulation of auditory information are global. His earliest speech productions are, similarly, extremely undifferentiated. As he grows, develops increased speech articulation skills, is exposed to a verbal language environment and explores that environment with his own speech productions, indications of differentiation start to appear. A series of sounds, either in imitation of what was heard or self-inspired, such as "/m/a/m/a/" or "/d/a/d/a/," are produced by the child. If heard, it is rewarded, of course. It is rewarded by an adult associated with many previously experienced positive reinforcing situations. A circular reaction goes into effect once again. Production of a specific sequence of sounds results in a positive reinforcement which may include some verbal communication from the reinforcer. This, in turn, inspires further speech production from the infant; hence, improved performance. In time he will acquire a vocabulary of labels which are related to objects within his environment.

It is not the intent nor within the scope of this paper to define the intricate process of language development. It should be mentioned, however, in that it appears to be intimately interwoven with the development of auditory perceptual skills. Just as the child's early vocal-motor skills are global in character, so too is vocabulary. The pre-school child may have one word - "big" - which he uses to indicate the size of objects that cannot be classified as "little." As he develops, he acquires a variety of more precise words which may be applied to previously labeled "big" objects. Such words as "tall," "high," "long" and "wide" now begin to appear in his spoken vocabulary. As they do, he practices the production of these more intricate speech patterns. These motor components accompany the sensory inputs received by the hearing mechanism and, thus, serve an important function. Just as body movements -- and more specifically, the hands -- "teach" the eyes the analytical skills of efficient visual-motor function, so does the vocal mechanism provide the ears with the motor information needed for developing the analytical skills of efficient auditory perception. Hence, it follow that, as poorly developed finger manipulation skills deter the development of adequate visual-motor skills, poorly articulated speech patterns will not provide the ears with the support required for achieving differentiated auditory perceptual abilities.

Mention was made previously about the involuntary manifestation of overt motor involvement when one is presented with a sufficiently complex visual stimulus. A similar phenomenon may be observed when one is presented with an overly complex auditory stimulus. In this instance the vocal mechanism, rather than the hands, will provide the additional support. Certainly we have all experienced the need to restate a word or series of words to ourselves. This is yet another demonstration of the benefit provided by overt motor manipulation of sensory information. Restatement of the stimulus allows for the analysis and ordering; for recoding and determining where the "spaces" belong. Further, much of the young child's speech-audition repertoire is characteristically composed of language labels related to concrete objects. In essence, early language is a verbal representation of a percept which, in turn, is based upon a covert motor component. In oversimplified terms, language development allows for a less strenuous means of representing movement. It provides a method for transmitting extensive motor information in very brief and efficient fashion. For these -- and yet more -- reasons, general-motor skills are an important consideration in auditory-motor function.

The importance of a spatial coordinate system for organizing visual information has been described previously. A similar functional device is required for the ordered manipulation of auditory information. The nature of sound, however, requires a different matrix. Sound is temporal. Organized time is rhythm. The child's rhythmic skills appear to be derived from his ability to coordinate the two sides of his body in synchronized movement which, at least in part, requires the determination of a consistently preferred side. Walking, running and skipping, if performed properly, are all acts that depend upon the synchronized interweaving of the two body sides. Once again, then, one notes the importance of appropriate general-motor development in that it provides the basis for construction of the internalized organizational matrix required to order auditory information effectively.

Six units have been defined for testing and, if needed, teaching the pertinent auditory-motor skills. The beginning units are concerned with non-verbal stimuli. Those are followed by objectives that involve the manipulation of verbal auditory information.

> Unit I - Superimposition. Tests are provided for probing the child's ability to adapt a variety of movements to an imposed tempo, e.g., marching to a drum beat.

> Unit II - Matching (Non-Verbal). The objectives in this unit are concerned with the child's ability to reproduce sound patterns varying in rhythm, pitch and volume, as produced by clapping, buzzers, xylophones, etc.

> Unit III - Embedded (Non-Verbal) Sounds. These tests are designed to assess the child's ability to identify specifically designated non-verbal sound patterns that are embedded in a context of similar nature; e.g., given a specific pattern, such as "loud, soft, soft," can the child respond when this particular sequence occurs within an extended chain of loud and soft claps?

Unit IV - Matching (Verbal). The objectives contained within this unit require that the child listen to and repeat meaningless verbal sound patterns of increasing length.

Unit V - Embedded (Verbal) Sound. These objectives follow the format of Unit III, except that the auditory stimuli are verbal; e.g., given previous instruction, can the child recognize and locate the short vowel sounds within the context of a word or series of words?

Unit VI - Reordering of Auditory (Verbal) Information. The basic concern of this unit is the child's ability to analyze the sounds in a given word to the degree required for reordering the sequential arrangement of those sounds; e.g., can he, upon proper instruction, appreciate and reconstruct the sounds contained within the word "lady" to produce "delay"?

Integrative - Thus far the discussion has been primarily concerned with intrasensory processes. The general goal of this curriculum area is to test and, if indicated, teach the skills required for relating information processed by one perceptual mode to another. Classroom achievement requires the firm establishment of cross-modal (intersensory) participation. Essentially, usual classroom activities require that information be received through the eyes and/or the ears, and that responses emanate from the hands and/or the mouth. Efficient performances require that the transfer of information occur virtually instantaneously. The reading process, from its early decoding stage, obviously depends upon the presence of this ability.

Developmental studies have demonstrated that auditory-visual integration of symbols is not well established in the very young child (Birch and Lefford, 1967); rather, it seems to develop as the child approaches the age of entry into school. It may be observed that once again, motor participation -- initially overt, ultimately covert -- is the key element in the development of the ability to establish intersensory equivalence with minimal confusion. That is, in early life the child must combine some motor involvement with the sensory information being received by his eyes and ears for effective processing. What the child sees and hears, he also manipulates and explores physically. Later, these manipulations may be performed simultaneously by his eyes and ears without any overt indications of motor participation.

Five units have been defined for testing and, if needed, teaching the important cross-modal skills.

> *<u>Unit I - Bilateral Integration</u>. This unit is not truly cross-modal in design. The stated objectives probe the child's ability to perform specific activities which indicate a properly developed capacity to involve both body sides in synchronized, rhythmic fashion. Earlier studies (Rosner, et al., 1969) have indicated that this ability is highly interrelated with certain auditory perceptual skills.*

> *<u>Unit II - Haptic-Visual Integration</u>. The behavioral objectives of this unit are concerned with the child's ability to relate that which he feels with that which he sees. Such factors as size and shape differences are explored.*

Unit III - Visual-Auditory Integration. The tests of this unit require, in varying degrees of difficulty, that the child produce some type of verbal or non-verbal sound response from a visual stimulus.

Unit IV - Auditory-Visual Integration. The tests of this unit require, in varying degrees of difficulty, that the child produce some type of graphic response from an auditory stimulus. This, too, ranges from non-verbal to verbal.

Unit V - Alphabet. This unit is a combination of the previously probed abilities but devotes itself exclusively to the manuscript letters of the alphabet. Tests are provided to assess the child's ability to:

1. Match to sample the lower case and capital letters of the manuscript alphabet.
2. Upon being shown a letter, identify it by name.
3. Identify the letters upon verbal command.
4. Print the letters from dictation.

A color-coded system for teaching the manuscript alphabet has been developed and provided for use where indicated (Rosner, 1969).

Achievement of the terminal objectives of these four curriculum areas should indicate that the child is adequately prepared to meet the information processing demands of a first-grade program. He will have developed, and will be capable of demonstrating, the truly essential readiness skills which form the base for performing the higher order cognitive tasks he will face. This does not imply that his intellectual capacity, as assessed by a standardized I.Q. test, will have been raised. (Nor does it imply that his I.Q. may not have been raised.) Rather, it does suggest that he will *be able to process concrete information at an appropriate level and hence learn more efficiently.*

Discussing the integrative curriculum area last infers that is represents a higher level of development than those areas previously presented. In some ways this is a correct interpretation; in some ways it is not. Certainly a child whose visual and auditory perceptual skills are well developed may be expected to demonstrate capable integrative skills. Similarly, a child who manifests a deficit in one of those two perceptual systems may be expected to reflect his inefficiencies in the integrative processes. Thus, it does appear that capable integrative skills depend upon adequacy in those functions that are to relate in cross-modal processing. It is incorrect, however, to assume that exposure to the integrative area of the curriculum should be delayed until intra-sensory channels are functioning efficiently. The contrary is, in fact, the case. The child who is experiencing confusion in the analysis and/or recoding of visual information may very well be aided by some verbal mediation; by "talking through" an act. The child who is unable to organize auditory information may be assisted by having a supporting visual component added to the task.

Hence, as has been recognized by at least some remedial educational approaches (Lower, 1968) an instructional approach that attempts to exploit the areas of strength while attempting to habilitate the deficit functions may be both practical and effective. The earlier offered suggestion that a teacher modify instructional situations so as to accommodate existing perceptual strengths and deficits indicates acceptance of such remedial educational approaches.

An individualized approach to instruction implies that each child will be taught -- not exclusively on his terms nor the terms of the system. Rather, it acknowledges that each child is a unique being with strengths that may be legitimately exploited and weaknesses which should be respected and, as much as possible, habilitated. A perceptual skills curriculum offers the teacher one more way of appreciating the individuality of the child and a means for providing him with the skills prerequisite to academic achievement while continuing to respect his integrity.

The current classroom testing of the curriculum will provide the data for validation of the hierarchy of the behavioral objectives within each unit as well as the interrelationship of the various units within and between curriculum areas. It is logical to anticipate that refinement will be indicated as a result of these data. The equating of the children's responses to norm-referenced tests and those criterion-referenced ones of the curriculum will also provide important information. In addition, classroom experiences will allow for the development of management techniques that are so essential for practical use of the curriculum. These efforts are currently in progress and will be reflected in the anticipated revisions of the curriculum.

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