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THE DESIGN OF LEARNING ENVIRONMENTS FOR CHILDREN CLASSIFIED AS 'HANDICAPPED'

by

GEOFFREY WEILAND

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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ABSTRACT

THE DESIGN OF LEARNING ENVIRONMENTS FOR CHILDREN CLASSIFIED AS 'HANDICAPPED'

by

Geoffrey Weiland

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Current literature in designing learning settings for children classified as 'handicapped' reveal two basic implicit assumptions: 1. Children classified as 'handicapped' have fundamentally different design needs from children labelled 'normal;' 2. 'Handicapped' children require a reduced level of stimulation from what is theoretically formulated for 'normal' children. This research examined an alternate design perspective with the following set of assumptions: 1. Children classified as 'handicapped' and 'normal' are fundamentally alike in their design needs; 2. By offering children varied opportunities to interact and effect their settings, a stimulus enriched setting promotes learning from all children, regardless of psychiatric/education classification.

This study examined the behavior and learning of four groups of ten latency age children, classified as 'neurologically impaired-emotionally disturbed,' 'moderately mentally retarded,' 'learning disabled,' and 'normal.'

These children were studied in a 'reduced' and 'enriched' stimulus setting. The children's Behavior, Attention, Affect and Learning Performance was evaluated in each of the two settings during a free play period and four learning tasks. Repeated measure ANOVA's by setting and between groups were performed for each variable during each play period and learning task.

Results indicated that despite characteristic differences between the four groups, there was a significant degree of similarity among all groups in terms of their Behavior, Attention, Affect and Learning Performance. All groups displayed a significantly greater frequency of behaviors and affects consistent with learning, as well as a greater learning performance, in the 'enriched' than in the 'reduced' stimulus setting. At times, the 'handicapped' children evidenced more difficulty coping with the 'reduced' than with the 'enriched' setting. Intergroup differences do not support the need for a different set of design assumptions for 'handicapped' children from those formulated for 'normal' children. The stimulus 'enriched' setting was found to be beneficial to learning for all children, regardless of psychiatric/educational classification.

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This dissertation is what it is due to my wife Karen. Her loving involvement and endurance, during all phases of its development, was vital. My gratitude and love of her will always be.

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CHAPTER I

OVERVIEW OF THE RESEARCH

Much has been written regarding the educational and psychological problems of children categorized as 'handicapped.' This literature which typically focuses on the special needs of these children in terms of their educational planning and psychotherapeutic needs, has not addressed itself sufficiently to their design needs. Consequently, the prevailing design perspective, developed almost exclusively by designers, lacks an adequate integration of psychological principles that are essential to an appreciation of the role that the physical environment plays in the learning process. The present study seeks to address this situation by examining and empirically testing current design principles for the 'handicapped.' The study attempts to expand the current knowledge base that exists in the design literature by integrating psychological and design concepts into an alternate design perspective that takes account of the vital role that the physical setting has in promoting learning.

In contrast to the multiplicity of theories and intervention strategies that have been formulated to meet

the 'handicapped' child's educational and psychotherapeutic needs, the design literature reflects a set of assumptions that has been generally shared among the designers. Though there is no unified theoretical model, an examination of the design literature for the 'handicapped' indicates an emphasis on the impact of stimulation on the child. The designers perceive the 'handicapped' as impaired in their ability to effectively process stimulation. In light of this impairment, the designers focus on the potentiality of 'handicapped' children to be distracted and disoriented and unable to effectively learn in a classroom settting formulated in terms of the stimulus properties of those developed for 'normal' children. Accordingly, the designers postulate the need for a specially designed setting with many of the special design considerations directed towards reducing the stimulus properties from what has been formulated for 'normal' children in a 'regular' classroom setting. These special design strategies are perceived by the designers as serving a compensatory function in aiding the 'handicapped' child in managing with the stimulus demands and pressures from the environment.

The present study seeks to examine two interrelated design assumptions which underlie the special design strategies for the 'handicapped' as formulated by the designers. They include:

1. Children classified as 'handicapped' have fundamentally different design needs from children labelled 'normal.'
2. 'Handicapped' children require a reduced level of stimulation from what is theoretically formulated for 'normal' children.

This research will address itself to a design conceptualization that seeks to redirect this prevailing design perspective from its present emphasis on modified stimulation to one in which the interactive relationship between the child and the environment is examined. The frame of reference developed in this study is based on principles derived from concepts on 'competence,' which does not distinguish between the needs of 'handicapped' and 'normal' children but rather views all children as fundamentally alike in their basic learning needs. In that learning is viewed as resulting from the children's interactions with their environment, those settings which promote child/environment interactions are viewed as beneficial to learning for all children, regardless of psychiatric categorization. In this light, the view of this study is that the varied and complex stimulus setting that has been viewed as beneficial to the 'normal' child is viewed as equally beneficial to a child classified as 'handicapped.'

The following two assumptions are derived from this

perspective:

1. Children classified as 'handicapped' and 'normal' are fundamentally alike in their design needs.
2. By offering the child opportunities to interact and effect their settings, a varied, 'enriched' stimulus setting promotes learning for all children, regardless of psychiatric/educational classification.

The present research will explore these issues by examining the behavior and learning of latency age children categorized as 'handicapped' and 'normal.' These children will be studied in two settings that will differ from one another in terms of their stimulus properties. Setting 1, the 'reduced' setting will be characterized by concepts consistent with the prevailing design literature, while setting 2, the 'enriched' stimulus setting, will reflect the concepts developed in the present study.

The perspective of the present study is that until there is theoretical justification and empirical evidence to the contrary, the formulation of special and separate design considerations for 'handicapped' children, from that which has been designed for children categorized as 'normal', are viewed as premature and possibly a misguided design strategy at the present time that may hinder rather than promote learning.

CHAPTER II

THE DESIGN PERSPECTIVE:

DESIGN ASSUMPTION I; CLASSIFYING THE HANDICAPPED

In reviewing the literature on designing learning settings for 'handicapped' children, a central issue that emerges is the manner in which the designers have conceptualized the differences between 'handicapped' and 'normal' children and the implications of these differences in terms of the children's design needs (Bayes, 1967; Bednar & Haviland, 1969; Gordon, 1972; Lady Allen, 1968; Moore, Cohen, Oertel & Ryzin, 1979). Many of the design considerations formulated for the 'handicapped' are based on a set of explicit and implicit assumptions regarding the character and design needs of 'handicapped' children.

Many of the prevailing design concepts for the 'handicapped' are based on the writings of Bayes (1967). Bayes defined the population of 'handicapped' as including children who, because of the character of their disabilities, required special care from the 'normal' population. He included within this general grouping, children categorized as mentally retarded, emotionally disturbed, physically handicapped as well as those with either partial or total loss of hearing and sight. Bayes's discussion

reflects the view that the child's 'handicap' was an impairment that resided within the child and that as a consequence, the children required a specialized setting that could compensate for the child's inherent limitations. In this regard Bayes advocated for the formulation of special design strategies for the 'handicapped' from those that have been developed for 'normal' children.

While Bayes emphasizes the need for distinguishing between the design needs of the 'handicapped' and the 'normal,' he does not discriminate between children within the general 'handicapped' population. He views each child's 'handicap' as fundamentally interrelated with other 'handicaps' with each child manifesting disabilities in more than one area of functioning. As a consequence, rather than formulating special design strategies for particular types of 'handicaps,' his special design considerations are aimed at the general 'handicapped' population. He states:

> Most handicapped people suffer in more than one of these groups. Mental subnormality and emotional disturbance often overlap, physical disability may be accompanied by emotional and mental handicap. These categories and classifications can easily break down, and inevitably it is only the whole human being in his full complexity that can be considered (p. 22).

Bednar and Haviland (1969) adhere to many of Bayes's classificatory conceptualizations, seeing the overall 'handicapped' population as comprised of a wide variation of children. 'Handicapped' children are referred to as 'learning disabled' and are defined in the following way:

> The most serious learning disabilities are caused by dysfunctioning intellectual or psychological systems ... it includes the brain-injured child whose perceptual processes are scrambled and who may not be able to learn at all -- he cannot be 'fitted' with a learning device. It includes the emotionally disturbed child (who cannot produce an appropriate response because his image of self is not positive), the socially maladjusted child (who cannot even look at the teacher or sit next to another child), and the mentally retarded child (who simply does not have the intellectual capacity) .... This group includes children from many other groups including epileptics, cerebral palsied .... All levels of intelligence or I.Q. are present from the gifted to the slow learner (p. 3-2).

In developing practical design strategies for these children, the designers stress the importance of grouping these children in terms of their observable learning difficulties rather than focusing on conventional medical classification, concluding that the special needs of these children would best be served if they were categorized in terms of the severity of their 'learning disabilities' (Bednar & Haviland, 1969).

In describing the character of such an impaired child, the authors cite Frampton (1955) who states:

> A handicapped child is a child who cannot play, learn, work, or do the things other children of his age can do; or who is hindered in achieving his full physical, mental and social potentialities whether by a disability which is initially mild but potentially handicapping, or by a serious disability involving several areas of function with the probabilitiy of lifelong impairment (p. 45).

In developing a general behavioral portrait of a child with serious 'learning disabilities' Bednar and Haviland describe the behaviors of children classified as 'brain

injured' as representative of the types of behavioral difficulties of those children comprising the 'handicapped' population. In referring to the general 'handicapped' grouping, the authors state:

> A term which seems to be more and more often applied to this group in general is 'brain injured.' It is being advanced by several leading figures in the special education field in an attempt to break down the barriers of existing medical classification (p. 3-4).

Basing much of their classificatory perspective on the research conducted by Cruickshank (1957) on the 'brain injured' child, Bednar and Haviland define the 'learning disabled' as manifesting any one or a combination of impairments that are characteristically representative of a child classified as 'brain injured' and which include the following:

sensory hyperactivity

low attention span

poor memory

perseveration

dissociation

figure-ground reversals

motor hyperactivity

poor motor skills

poor self concept

distorted body image.

The authors classificatory perspective of the 'handicapped' is based on children "who deviate from the average to an extent requiring special services." This

view, which is consistent with a 'statistical' approach towards classification is not consistent with the authors inclusion of children regarded as 'handicapped' due to impairments that are inherent to the child, i.e. brain injury, epilepsy and physical handicaps. In this regard, the designers utilize two perspectives in classifying the 'handicapped': the 'statistical' model, which focuses on deviations from a norm, and which views the child's handicap as a variation in normal growth and development; and the 'pathological' model which perceives a child's handicap as an attribute of the child and reflective of a medical pathological condition.

Bednar and Haviland, like Bayes, view each 'handicap' as essentially interrelated with one another and as a result do not discriminate between the different groups of children who comprise his 'handicapped' population in terms of their design needs. Most importantly, in terms of the issues raised in this study, the authors adhere to Bayes's view that children categorized as 'handicapped' are essentially different from the 'normal' population in their design needs and require a separate and special set of design considerations from those that have been developed for the 'normal' child.

The design concepts of Moore et al. (1979) are basically rooted in the considerations of Bayes and Bednar and Haviland. In terms of defining the general 'handicapped' population, the authors include those children who have

disabilities affecting any of the three major areas of development. Included within the classification of 'physical disabilities' are children categorized as having orthopedic, neurological or mild motor related disabilities. Children classified as 'perceptual-intellectual disabilities' include those categorized as mentally retarded as well as those categorized as having speech and communication impairments, visual and hearing limitations and special learning disabilities. Children categorized as having 'social-emotional disabilities' are children classified as having a behavioral disorder or emotional disturbance as well as include those classified as delinquent.

In terms of each of these three general clasifications, Moore et al., like Bayes as well as Bednar and Haviland, stress the interrelatedness of each 'handicap' to one another, and often direct their design considerations towards the general 'handicapped' grouping without specifically aiming certain special design considerations towards any particular subgrouping of children.

Significantly, Moore et al. share the views of the designers previously discussed in their advocacy of special design considerations for the 'handicapped' from those that have been formulated for the 'normal' child. With regards to this issue, Moore et al. state:

> Common to all these conditions are developmental difficulties and lags that require a modification of early childhood or school services in order to insure maximum potential development and school

learning (p. 10).

In sum, the designers discussed in this section share similar views towards defining the character of the 'handicapped' population. In developing their design concepts, the designers have adhered to a perspective that dichotomizes children into 'handicapped' and 'normal' populations based on a child's psychiatric/medical 'handicap.' Each of the designers discusses the importance of not viewing each 'handicap' as separate and discrete from one another but rather emphasize the fundamental interrelated nature of these 'handicaps' to one another. In this regard, most of the special design considerations are directed towards a general 'handicapped' population rather than to a specific grouping of children. Due to the character and magnitude of these 'handicaps' all of the designers advocate the need for the formulation of specially designed learning settings for the 'handicapped' from that which has been developed for the 'normal' child.

CHAPTER III

THE DESIGN PERSPECTIVE: DESIGN ASSUMPTION 2; SPECIAL DESIGN NEEDS OF THE HANDICAPPED

In light of the perceived differences between 'handicapped' and 'normal' children, designers stress the need for developing a separate set of design considerations for the 'handicapped' to meet their special learning needs. Among the issues they focus on is the negative impact that the varied, complex stimulus setting for the 'normal' child would have on the learning behavior of the 'handicapped' child. They discuss the need for a reduced stimulus setting characterized by a reduction in the overall stimulus qualities from that which would be optimally designed for the 'normal' child.

Though each of the designers acknowledges the value of a varied, complex stimulus setting in promoting interest and challenge, the 'handicapped' child is viewed as having difficulty in effectively adjusting to the degree of stimulation that has been found beneficial for the 'normal' child. Much of their concern is focused on the potentiality for a 'handicapped' child to respond to the stimulation of a regular classroom setting with restlessness and distractability.

This perspective is rooted in the fundamental assumption that a child categorized as 'handicapped' has an inherent cognitive impairment that renders them ineffective in handling the stimulation that is found in a setting designed for a 'normal' child. A varied, complex setting is then viewed as one which is beyond the cognitive abilities of the 'handicapped' child to process. In terms of this issue, Moore et al. state:

> Environments with which the average child can cope are often frustrating or impossible for a child with reduced competence .... Exceptional children are sometimes confused and even thrown into a hyperactive state by environments that are unnecessarily ambiguous, contradictory and complicated (p. 64).

Each of the designers discusses the positive motivational value of a varied stimulus setting in promoting a child's interest in learning. Each relates, however, that this view needs to be modified somewhat when it is applied to the 'handicapped' population; that the varied, complex stimulus setting which has proven to be so effective for the 'normal' child may be cognitively overwhelming for the 'handicapped' child. The designers advocate the need for a reduced, specially balanced stimulus setting in order to provide the additional environmental support and 'control' over excessive and 'extraneous' stimulation that is so disruptive to the 'handicapped' child. Moore et al. state:

> Activity areas should be simple and have a limited number of pieces of equipment .... Irrelevant stimuli should be eliminated; this will help control children who are prone to sensory hyperactivity ....

> To aid in way finding and orientation, the environment should be straightforward and unambiguous .... The built environment should be orderly and consistent so that it does not confuse any exceptional children who have learning or perceptual difficulties .... the reason for orderliness in the lives of such children is to avoid the overstimulation and disorder that easily affects them .... Orderliness and consistency in the environment may reduce perceptual ambiguity, irrelevant stimuli, and hyperactivity and thus may increase the conduciveness of the environment for the entire learning process. Predictability and a certain amount of simplicity may reduce the sensory-based hyperactivity and inner anxiety so common in the experience of the exceptional child (p. 60).

In discussing the importance of order and consistency, Bednar and Haviland examine the problems associated with "clutter or visual noise:"

> It (visual noise) begins with the number and variety of things in the visual field, and can be further compounded by their lack of order and the grouping of dissimilar things. Where there is clutter, a good deal of time and effort can be lost in just finding the object that is to be viewed. This can be a particularly significant concept in environments for children with perceptual learning disabilities. The problems of sensory hyperactivity, dissociation, figure-background reversal and perseveration can be directly related to this 'visual noise' (p. 6-6).

In developing specific design strategies to implement their theoretical position, each of the designers advocates the need for materials that are well defined and consistent with one another as well as controlling for 'extraneous' and ambiguous stimulation. Bednar and Haviland stress the importance of avoiding 'ambiguity,' and the need for a relatively simple, straightforward setting for the 'handicapped.' They state:

> There is almost universal agreement on the necessity to avoid ambiguity in buildings for emotionally-disturbed and mental subnormal children. The concept pervades many architectural decisions for these children. All children must develop a certain sense of security, confidence and comfort in relation to their environment, but children with perceptual, motor and psycho-social disabilities are in even greater need. Because their perceptual development may be stunted, visual 'tricks' in the built environment only confuse them (p. 7-5).

In terms of consistency of stimulation, in referring to the 'handicapped' child, Bednar and Haviland state: "The lack of consistency in his behavior must be compensated by consistency in the environment" (p. 7-10). In terms of specific strategies they suggest:

> Careful consideration of changes in the environment such as furniture rearrangement, paint color changes, space use alteration, and shifts in lighting level and quality. These changes should not be made suddenly 'over the weekend' .... hardware in doors, windows, cabinets and even toilet partitions which is not only simple to operate, ... is consistent throughout (p. 7-10).

Overall Bednar and Haviland suggest that the specialized setting for the 'handicapped' should reflect 'simplicity, honesty, unambiguity and consistency."

The basis of the design concepts regarding the reduction of stimulation is mostly related to the early writings of researchers who examined the impact of stimulation on 'brain injured' children (Cruickshank, 1967, 1977; Johnson & Myklebust, 1967; Strauss & Lehtinen, 1947). Strauss and Lehtinen's early work (1947), which was exclusively involved with children who evidenced signs of 'brain injury' and which was rooted in a medical frame of

reference, perceived these children as suffering from a subclinical neuro-cognitive deficit in their ability to effectively process stimulation. Accordingly, these authors devised a variety of specific environmental modifications to meet the special needs of these children. In that many of the special design considerations formulated by the designers are adaptations of these earlier design strategies, the following discussion reviews the specific design concepts that these early researchers formulated to meet the perceived design needs of these 'brain injured' children.

Strauss and Lehtinen (1947) noted that the 'brain injured' child's reactivity was beyond the child's control and that due to an inferred organic restlessness and distractability, the constant stimulation found in a regular classroom would promote diffuse, disinhibited behavior. The 'normal' classroom, where stimulation was used to interest the 'normal' child and promote an active engagement was seen as not appropriate for these children (Strauss & Lehtinen, 1947). According to these authors 'brain injured' children could not learn in a 'normal' classroom setting but required a setting designed to suit their nervous system dysfunction. They believed that by manipulation and controlling the environment in certain ways, the child would develop voluntary control over their impulses.

To achieve the optimal environment, Lehtinen noted the importance of a small group size, not to exceeed 12, and a large classroom with distances separating the children. The room should be devoid of all visually stimulating material, from covering the windows to having the teachers wear plain and unornamented clothing. Lehtinen indicated that at times it might be necessary to place a child facing a plain wall or isolating the child by screening the child off from the rest of the classroom setting. In addition, with respect to materials, she recommended using the barest essentials. She would cut away the borders of pictures and covers of reading material in order to expose only a small area at a time. According to Lehtinen, as 'control' was imposed on the physical setting, learning with greater 'control' was possible.

Cruickshank's (1977) design strategies were a modification of Lehtinen's concepts, based upon four essential principles which Cruickshank believed comprised a good teaching environment for children whom he categorized as 'brain injured.' Cruickshank's principles included the following:

1. The reduction of unnecessary stimulation.
2. The reduction of space.
3. The establishment of a highly structured daily program.
4. The increase of the stimulus value of the instrumental materials.

Cruickshank, like Strauss and Lehtinen, suggested that the classroom be devoid of nonessential stimulation; the colors of the walls, woodwork and furniture should match the floor, the windows should be opaque, the room should be sound treated and the number of children within the room should be held to a minimum. In addition, he noted that space should be reduced to the smallest practical area to the point of constructing small cubicles for each child in order to reduce the distractability that is promoted by excessive and extraneous stimulation. These cubicles should reflect 'consistency' with the other structures in the classroom, such as being of the same color. All teaching materials must be kept out of sight and the number of visitors to the room should be kept to a minimum.

Like Lehtinen and Cruickshank, Johnson and Myklebust (1967) suggested that the classroom be free of excessive and extraneous visual and auditory stimulation. They believed that toys should be kept out of sight and floors muted with rugs or tiles. For a child who loses behavioral control and who disrupts a class, they recommend a small 'quiet room' with low levels of stimulation in order to restore the child's 'control' over their behavior.

In sum, in terms of developing design considerations for the 'handicapped,' the designers have advocated for a reduction in the overall stimulation from that which has been developed for the 'normal' child. Though

acknowledging the importance of varied, complex stimulation and the need for a specially balanced stimulus setting, the designers emphasize the importance of reducing the complex stimulation optimally designed for the 'normal' child and stress the importance of a specially designed setting characterized by consistency, orderliness and simplicity.

CHAPTER IV

PERSPECTIVE OF THIS STUDY

The perspective of this research is that there is little theoretical justification or empirical evidence to support the prevailing design assumptions examined in this study. In terms of Design Assumption 1, it is highly questionable whether psychiatric/educational differences between 'normal' and 'handicapped' children translate into special design needs. Moreover, in terms of Design Assumption 2, the adoption of design strategies that seek to reduce the level of stimulation of settings for the 'handicapped' from those formulated for the 'normal' child are similarly viewed as unjustifiable given our present level of knowledge regarding how children learn.

The following discussion will direct itself towards critically examining the two implicit design assumptions underlying the prevailing design perspective. It will offer an alternate perspective which is an effort at reconceptualizing the basic assumptions involved in designing for all children, regardless of psychiatric/educational classification. This redirection will be rooted in concepts that focus on the vital role that the interactive child/environment relationship has in

learning.

Design Assumption 1

In terms of the first design assumption, the designers have adhered to the view that medical/psychiatric/educational differences that exist between 'handicapped' and 'normal' children translate into differences in their design needs. An examination of the design literature suggests that the designers have adopted this view without recognition that they have been adhering to a classificatory model that is based on medical/educational symptomatology, such as an inherent physical limitation, a perceived psychiatric disability or a specific problem related to academic achievement and not on anything to do with how a child behaves in a particular setting.

It is not clear that this classificatory perspective, itself, represents the best knowledge, but even if it might be useful in psychotherapeutic planning and in developing individual instructional programs for learning problems, it is doubtful whether such a view, which ignores the impact of the physical setting on the behavior of the child, is an appropriate perspective for developing special design considerations. Psychiatric/educational differences between children do not necessarily translate into different design needs.

Bayes, Bednar and Haviland as well as Moore et al.

adhere to the dichotomization of children into 'normal' and 'handicapped' groupings in terms of their psychiatric/ educational handicaps. Despite statements to the contrary, each adopts conventional medical/psychiatric groupings and formulate special design strategies to meet their perceived special design needs. These psychiatric groupings are based on a child's performance on standardized objective and projective tests and clinical observations during structured psychiatric interviews however, and not on how the child behaves and learns outside of the formal clinical setting.

The view of this study is that the dichotomization of children's design needs is rooted in the underlying assumption that due to the child's perceived neuro-cognitive impairment, they are unable to effectively cope in a regular classroom setting. As a consequence of this view, the thrust of the special design strategies has been towards compensating for the child's impairment by manipulating and altering the physical setting. Children and their setting are viewed as independent from one another, with the setting acting upon a relatively passive child and eliciting certain behaviors.

The child's 'handicap' is perceived of as an inherent attribute of the child requiring special design strategies in order to compensate for the child's impairment - in much the same way that rails may be designed to facilitate mobility for the blind child. Reflecting this position,

Moore et al. state:

> Some exceptional children have difficulty finding their way through buildings because they cannot easily and quickly organize in their minds sequences of time and space. They also have difficulty with sequences of verbal and spatial directions and with mentally forming meaningful wholes from separate experiences. Therefore the environment should be clearly presented so that the whole space can be easily recognized .... Unnecessary ambiguity -- stimulating to the average child but potentially confusing and frustrating to the special child -- should be avoided (p. 57).

In an effort to be less medically oriented and to focus more on the "observable realities," both Bednar & Haviland and Moore et al. claim adherence to a classificatory view that is consistent with a statistical model -- that a child's 'handicap' is reflective of a deviation along a continuum of behaviors that reflect normal growth and development. This statistical approach however, which focuses on the essential similarities of all children, would suggest an environment for the 'handicapped' which would sensitively emphasize the same design needs of all children, regardless of classification rather than focusing on the child's perceived 'handicap.'

Overall, the designers categorization of the 'handicapped' reflects the mixing of two classificatory perspectives wherein many of the design strategies adhere to a statistical approach in that they are consistent with the design needs of all children, regardless of medical classification, while other design strategies which reflect a medical/pathological perspective are clearly

directed at compensating for a perceived impairment in the 'handicapped' child.

This mixing of classificatory approaches is illustrated in Moore's design considerations regarding 'ambiguity.' Reflecting on the need to compensate for the child's perceived medically based neuro-cognitive impairment in their ability to cope effectively with stimulation, Moore et al. state: "Unnecessary ambiguity, stimulating to the average child but potentially confusing and frustrating to the average child -- should be avoided." Later in their discussion however, on the importance of promoting imaginative play for all children, they state: "provide ambiguous, undefined settings and structures for children's imaginative and creative play," a view which is consistent with a statistical approach in that it addresses design needs that all children share regardless of a disabling 'handicap.' Statements such as these illustrate the practical problems of translating many specially formulated design considerations when two mutually exclusive classificatory approaches are adopted interchangeably over a wide range of children with qualitatively different learning problems. In examining the issues that are inherently raised by mixing two different classificatory perspectives, Mercer (1973) states:

> When evaluations using a statistical model are conducted in conjunction with evaluations using the pathological model ... there is a tendency to think in terms of one model while operating with the other. Behavioral patterns are translated into pathological signs ... statistical abnormality is

> equated with biological pathology without any evidence based on functional analysis that this statistical sign is related to the biology of the organism or that it has any functional relationship to system maintenance (p. 21).

The dichotomization of children into 'handicapped' and 'normal' groupings not only ignores the fundamental similarities in the way all children learn but also reflects an inadequate conceptualization regarding the composition and character of the 'handicapped' population and how they compare with 'normal' children in their fundamental learning needs. The general 'handicapped' population is so broadly defined as to incorporate the entire scope of childhood psychopathology (D.S.M.III, 1980). Its range includes children who have been classified as 'profoundly mentally retarded,' who live in residential institutions and who cannot eat or dress themselves to children with normal intelligence and mild familial adjustment problems, who may be classified as having an 'emotional' disorder. It includes children with severe difficulties in adapting to the demands of reality and who require a great deal of psychotherapeutic attention to children with normal intelligence and good emotional adjustment who have mild reading problems and who may be classified as 'learning disabled.'

Bednar and Haviland's view of the composition of the 'handicapped' whom they interchangeably refer to as the 'learning disabled,' reflects inadequate and faulty conceptualization that is inconsistent with basic

psychological concepts regarding the character of these children. Their global classificatory view practically negates a meaningful implementation of their design considerations. While utilizing the term 'learning disabled' in a generic sense to describe all children with 'handicaps,' the educational literature is clear in stressing the unique defining characteristics of children categorized as 'learning disabled' that distinguish them from children with other problems. This literature strongly emphasizes the fact that the 'learning disabled' do not have problems that relate to either 'mental retardation' or 'emotional disturbance' (NACH, 1968; Lerner, 1968).

Further complicating their classificatory scheme, Bednar and Haviland refer to those children categorized 'brain injured' as representative of the character of the child typically regarded as 'handicapped.' Citing research conducted by Cruickshank (1967), the authors present a detailed behavioral portrait of a 'brain injured' child whom they view as reflective of the types of behavioral difficulties that are typically found in a child categorized as 'handicapped.' This perspective is totally inaccurate in that 'brain injury' is a specific diagnostic entity that has its own set of symptomatic behaviors that are unique to itself and not characteristically shared by children who are categorized as mentally retarded, emotionally disturbed, learning disabled or physically

handicapped. Noteworthy is that Bayes (1967) similarly bases many of his special design considerations on a single subgroup of children, the 'mentally retarded', and adopts many of their special design considerations when discussing the entire range of children whom he includes within the general 'handicapped' grouping. Moore et al. (1979) provide a more refined, discriminative discussion of the clinical composition of the 'handicapped' population than the other designers. Yet, beyond a relatively brief description that summarizes the psychiatric/educational differences between the children who compose the 'handicapped' grouping, their special design principles are directed towards the general population of children categorized as 'handicapped.' For example, they state:

> Exceptional children may experience distortion in their perception of visual, tactile and auditory stimuli and may have difficulty processing them. To assist these children, their environment must have a variety of stimuli presented in an orderly and consistent manner (p. 48).

Of particular significance is that grouping children under the general category of 'handicapped' and formulating specially designed therapeutic settings that would separate them from the regular school population may ultimately serve to enhance the children's problems and impede learning due to the resultant labeling and possible stigmatization of these children in their specially designed environments. By practically disregarding the distinguishing features of the children categorized as 'handicapped' in their design concepts, there is increased

likelihood that children with relatively mild learning problems may be treated as 'handicapped' as a child with severe mental, emotional or physical impairments. There is much literature that addresses the devastating effects of such stigmatization on personality development (Braginsky & Braginsky, 1971; Goffman, 1963; Scheff, 1966; Silverstein & Krate, 1975).

The view of this study is that dichotomizing children in terms of their perceived psychiatric/educational 'handicaps' does not necessarily translate into dichotomizing these children in terms of their design needs. Design concepts need to be based on the way the environment promotes learning rather than on how the setting can compensate for perceived impairments within the child. Though a mentally retarded child may require specially prepared instructional programs, they do not necessarily require a different learning setting from that of a 'normal' child. It would be more valuable to develop design considerations based on how a child learns and behaves in particular settings than on how a child performs under standardized formal testing conditions.

The view of this study is that children's behavior is a function of the character of the child and of the setting, with each setting carrying its own set of cues as to which behaviors it does and does not support. The same child in a relatively simple, non-complex setting may behave significantly different in a varied, complex

stimulus setting. The design conceptualizations discussed in the design literature suggest a view of the 'handicapped' child as an impaired, passive recipient of excessive levels of stimulation from the 'regular' classroom setting. Consequently, the designers have advocated for a modification in the stimulus properties of the 'normal' setting in order to compensate for the special learning needs of these children. If, however, we view all children, regardless of diagnostic classification, as motivated to actively interact with their environment and see learning as a function of the interactive relationship between the child and their setting, the design strategies that are directed at compensating for a perceived 'handicap' at the expense of designing for the needs of the whole child may do more harm than good. Until there is theoretical and empirical evidence to the contrary, there is little reason to adopt special design strategies for children within the 'handicapped' population that are different from those developed for children categorized as 'normal.'

Design Assumption 2

With regard to the development of special settings for the 'handicapped,' the present study takes exception to the view that the character of a specially designed setting for the 'handicapped' would necessarily reflect a reduction in

the complex stimulus properties of the child's learning settings from that which had been formulated for the 'normal' child. The former view is based on work by researchers who focused on children classified as 'brain injured.' There is little reason to assume, however, that these findings should necessarily be adopted for all children who fall within the designers excessively global categorization of 'handicapped.'

The assumption that the 'handicapped' require a 'reduced' stimulus setting from that of the 'normal' child is clearly not supported by psychological research. Research conducted on the impact of stimulation on 'handicapped' children is primarily based on studies conducted on children classified as 'mentally retarded,' 'brain injured,' and 'hyperactive.' These research studies have mostly been directed at examining the effect of stimulation on distractability and hyperactivity. Although these studies defined stimulation in global stimulus input terms and were conducted in non-learning settings without a design focus, the results of these studies suggest that the prevailing design perspective is not adequate to meet the design needs of the 'handicapped.' On the whole, these studies found stimulation to be disruptive for some children while for many others it was found to be of benefit (Suedfeld, 1980). The studies point out the importance of viewing the 'handicapped' with greater refined discriminative sensitivity and not to

assume that all children within the general 'handicapped' grouping share the same learning and design needs.

Specifically, with regard to the design strategies suggested by Lehtinen and those of Cruickshank, subsequent research conducted on the value of individualized cubicles have yielded mixed results. Whereas the reduced stimulation cubicle improved the child's capacity to focally attend to particular tasks (Shores & Haubrich, 1969), the child's performance did not necessarily improve (Cruickshank, 1977; Rost & Charles, 1967; Shores & Haubrich, 1969; Sommerville, 1974).

Whereas Strauss and Lehtinen as well as Cruickshank have referred to the 'brain injured' as a highly distractable group of children, other researchers have found that distractability is not necessarily a general personality feature for all children classified as 'mentally retarded' (Crosby, 1972; Rosenthal & Allen, 1978). Crosby found that some children categorized as 'mentally retarded' are highly distractable while others may be less distractable than a child categorized as 'normal.' Crosby believes that a proportion of 'mentally retarded' children have chronically low arousal levels and that, as a result, their interest and attention could be improved by a stimulating learning environment. Other children in this category, who exhibited chronically high arousal levels would learn best from his point of view, in a setting characterized by a reduced stimulus setting.

In terms of developing a more differential view of the 'mentally retarded' population, Gordon and Haywood (1969) differentiated between 'mental retardation' as a result of physiological damage and those children whose intellectual difficulties were ascribed to a deprived family setting or other social variables. The researchers suggested that stimulus enrichment would be a productive design strategy for those children whose 'retardation' was the result of a depriving environment and not related to organic causes. They viewed this group of children as evidencing stimulus deprivation or an 'input deficit' which manifests itself in a reduced capacity to process information. They suggest that these deficits, which were due to a deprived early environment, could be overcome by increasing the levels of stimulation offered to the child.

Zentall and Zentall (1975, 1976) found that increased stimulation was beneficial for many children categorized as 'hyperactive.' These researchers viewed 'hyperactivity' as a homeostatic mechanism utilized by the child to increase incoming stimulation when the environment was not providing a sufficient amount of stimulation. This perspective is in significant contrast to the others who have adopted the view that 'hyperactivity' is the result of neurological impairment that hampers the child's ability to effectively screen out irrelevant stimuli as well as their capacity to meaningfully organize relevant stimulation (Strauss & Lehtinen, 1947). Zentall's conceptualization is based on

the view that children are motivated to maintain a particular level of stimulation and that when the range of input becomes markedly discrepant from their needs, the child is motivated to restore the level of stimulation in order to reach a point of homeostasis.

These concepts were supported empirically by a study conducted by Zentall and Zentall (1976) in which they compared the learning performance of 'hyperactive' children in two experimental settings that differed in terms of their amount of stimulation. Though this study was not conducted in a setting that reflected a real life learning situation, the results are relevant in examining the impact of high stimulation on the learning process. In this study the children were found to perform better on a perceptual-motor task (circling particular letters of the alphabet in a large array) in a 'high' rather than in a 'low' stimulus setting. The 'low' stimulus setting was characterized by bare white walls, gray floors and continuous white masking noise, while the 'high' stimulus setting had colorful posters, mice in a cage, flashing Christmas lights and rock music playing in the background.

This literature review underscores the lack of support for the prevailing design assumptions and reveals some of the basic inadequacies of the design perspective that seeks to reduce the level of stimulation for the 'handicapped' from that which has been designed for the 'normal' child. It also points to some contradictions in the literature

regarding children in various psychiatric/educational categories. Importantly, in terms of the concepts developed in this study, much of the research cited in this literature review tends to place excessive emphasis on the amount and intensity of stimulation and not sufficient focus on the character of stimulation and the way in which stimulation promotes learning. Accordingly, there needs to be a reconceptualization, away from the emphasis on 'stimulation' to an examination of how the character of a learning setting evokes interest and stimulates a child to explore and the manner in which the quality of the stimulation and not only its intensity and amount facilitates learning. From the perspective of this study, central to resolving this issue is an examination of the role of the environment in learning. Such an understanding is viewed as the basis upon which design considerations should be formulated.

CHAPTER V

THE ROLE OF THE ENVIRONMENT IN LEARNING

Several authors have addressed themselves to the vital role of the environment in learning (Piaget, 1963, 1969; Murphy, 1962, 1976; Schachtel, 1959; White, 1970), emphasizing the fundamental role that the environment plays in facilitating learning by promoting interactions between a child and their environment. These writers stress the fundamental interrelatedness between the child and their setting and view each as mutually tied to one another. They view this child/environment interactive relationship as a developmental process that begins at the start of life.

Schachtel (1959) believes that out of the diffuse awareness of the early neonatal period, the infant begins to display focal interest in the environment. This development of focalized object interest develops autonomously and in contrast to traditional psychoanalytic thought, is not related to the satisfaction of needs or for the purposes of tension reduction. This early innate interest that the infant takes in their surroundings reflects an intrinsic need that children have for interacting with their environment and is the basis out of which children begin to develop a sense of reality.

Piaget (1963, 1969) conceptualized the child's actions in the environment, such as their moving through space, manipulating objects, searching with their eyes and ears, as resulting in the development of schemata. Central to his concepts regarding intellectual development was his perception that the child's actions in the environment, which provided the ingredients for assimilation and accommodation, was the vital and necessary conditions for the child's cognitive growth.

White (1970) postulated that the motivational energy for the child's actions and the directions that the child's actions took, such as in exploration of a room, was a function of the child's intrinsic need to be 'effectively familiar' with their environment and that a varied and responsive settting facilitated such explorative interactions. He viewed the child's playful explorations and manipulative activities as being promoted by the 'effects' the child's actions have. In fact, the critical issue in the child's motivation to interact is the degree to which the child has an 'effect' upon their setting -- whether something happens as a consequence of their actions. His discussion of 'play' reflects his view that a child's sense of their 'competence' grows out of these interactions.

> The child appears to be occupied with the agreeable task of developing an effective familiarity with his environment. This involves discovering the effects he can have on the environment and the effects the environment will have on him. To the extent that these results are preserved by learning, they build up an increased competence in dealing with the environment (p. 131).

According to White, the children's active explorative engagements with the environment are promoted by their needs for 'effectance,' "an active tendency to put forth effort to influence the environment" (p. 132), while feelings of 'efficacy,' which accompany the child's efforts, refer to the satisfaction that the child experiences as a result of their successful efforts. White believed that the child's growing sense of competence signifies the degree to which a child is able to produce desired effects upon the environment.

In developing her concepts regarding 'coping strategies,' Lois Murphy (1962, 1976) states that children's growing sense of competence is developed in part, by their ability to successfully cope with the pressures and demands of their environment. Murphy explored these issues, specifically focusing on the coping mechanisms that children develop in order to "set limits on the environment," and adapt to challenges and excessively stimulating environmental conditions. She examines the coping strategies that enable children to 'orient' as well as 'familiarize' themselves in situations which may be cognitively difficult by offering the child opportunities to cognitively assimilate and integrate a situation and time to develop cognitive-perceptual mastery.

With regard to coping with excessive stimulation, Murphy discusses strategies such as 'delay' or 'avoidance' as serving as preparatory actions enabling a child to

appraise and decide on a particular course of action. These strategies, according to Murphy, are normal and healthy self-protective actions and give the child the opportunity to assemble their resources, and oftentimes lead to more active and positive ways of dealing with overly stimulating situations. She finds that some children may resort to an overly stimulating setting with passive withdrawal or constriction and inhibition leading to either control or a reduction in the stimulus impact of a setting by offering the child additional time for orientation and acclimatization.

Murphy's view, overall, is that children develop the capacity to set limits on the environment in a process whereby they will seek out their own level of stimulation with which they can comfortably master. This process involves a sorting of the stimulus options that are available in a setting and that the child's behavior will reflect a fit between the opportunities in the environment and the child's resources and strengths.

Implications for Design

The perspective of this study is that learning is the result of the interactive relationship between children and their environment and that children develop feelings of competence as a result of these interactions. In light of these concepts, the prevailing perspectives for the

'handicapped' need to be reconceptualized. Rather than focusing on the impact of stimulation, the design of settings for the 'handicapped' needs to be guided by a perspective that incorporates the vital role that the physical setting plays in promoting learning.

Such a perspective, rooted in the children's intrinsic interest and motivation to interact with their environment, emphasizes the active interactional relationship existing between children and their settings -- perceiving each in a bidirectional flow; each acting upon the other with each changing with each new encounter, producing changes in the stimulus field through 'difference-in-sameness' (White, 1968).

The child's involvement with the environment is viewed as a spiraling process wherein children and their environment are fundamentally tied to one another and each are interrelated components of a whole child/environment process. Out of these interactions with their environment, children learn and develop competence in dealing with their environment.

This view suggests that to promote and sustain a child's interactions with their environment, settings that offer children opportunities to 'effect' their environment are significantly better than those settings with few stimulus options. Consequently, the varied, 'enriched' stimulus setting that is viewed as beneficial for the 'normal' child is similarly seen as equally of value to the

'handicapped' child. An 'enriched' setting would offer the child many opportunities to 'act' and experience feelings of competence resulting from these interactions while a 'reduced' setting would not offer the child sufficient stimulation that would encourage sustained interaction.

In terms of advocating the need for special design considerations for the 'handicapped' much of the design concern has focused on the difficulty that 'handicapped' children would have in effectively dealing with the varied 'enriched' stimulus settings that are viewed as optimally stimulating for the 'normal' child. In terms of this issue, the perspective developed in this study is that all children, regardless of diagnostic categorization, have coping strategies that enable them to adapt to varying environmental conditions. These strategies not only facilitate the child's interaction but also result in feelings of satisfaction in children's ability to effectively manage in their world. This capability of the child to master the environment has significant implications in that it suggests that rather than altering or modifying the physical environment of that designed for the 'normal' child in order to match the cognitive processing capability of the child, the child brings to each interaction with their environment coping mechanisms that enable the child to effectively adjust to varying degrees of stimulation. For each child there is an optimal amount and intensity of varied, complex stimulation, but that at

times, depending on the circumstances, the stimulation may reach levels that are beyond the child's coping ability (Yarrow, 1968). When the stimulation reaches such excessive levels, a reduction in the stimulus properties of the setting is clearly indicated and in the best interests of the child. In terms of the issues examined in this study however, there is little reason to assume that the 'enriched' stimulus qualities and levels of stimulation that are viewed as optimal for learning for the 'normal' child, are not equally of benefit for the 'handicapped' child.

Design considerations that are aimed at compensating for a child's perceived 'handicap' by reducing stimulation may result in not offering the child sufficient opportunities for interacting thereby hindering the child's development of coping strategies to deal with excessive pressures and demands from the environment. Many of the specially formulated design strategies for the 'handicapped,' which are aimed at reducing the varied, enriched stimulation of 'regular' classrooms, may significantly impede learning by interfering with the development of a child's coping skills. This interference reduces the child's capacity to develop mechanisms to adjust to the varying levels of stimulation found in their everyday environments.

In sum, the perspective of the present study is that the approach and direction previously used in developing

designs strategies for the 'handicapped' are based on a set of assumptions that are theoretically questionable as well as empirically unproven. The view that 'handicapped' children require a specially developed set of design considerations from that which has been developed for the 'normal' child is the basis upon which many of the special design strategies for the 'handicapped' have been based. The view of this study is that medical/psychiatric/ educational disabilities do not necessarily require an alteration in the environment.

The view of the present research is that design strategies should reflect concepts related to the role of the physical setting in learning. We view children as intrinsically motivated to interact with their environment and hypothesize that settings that are varied and stimulating will offer the child more opportunities to 'effect' their settings than environments characterized by reduced stimulus properties. Consequently, learning, for all children, regardless of perceived 'handicap,' is facilitated by 'enriched' stimulus settings.

CHAPTER VI

METHODS AND PROCEDURE

Overview of the Methodology

The present research evaluates the behavior of three groups of children classified as 'handicapped' and one as 'normal' in two settings that differed in terms of their stimulus properties; setting 1 was regarded as a 'reduced' stimulus setting and reflected many of the assumptions and the design strategies formulated for the special needs of the 'handicapped' as discussed in the design literature, while setting 2, the 'enriched' stimulus setting, reflected a set of assumptions as developed in the design concepts of this study.

Within these settings children were evaluated in terms of their Behavior, Attention, Affect and Learning Performance during an unstructured, free play period and four learning tasks, in each of the two settings.

Experimental Design

The present study was a two factor research design. The first factor, Diagnostic Categorization, a between-s variable, had four levels: 1. normal, 2. mental

retardation, 3. neurologically impaired-emotionally handicapped, 4. learning disabled. The second factor, Environmental Setting, a within-s variable, had two levels, setting 1, the 'reduced' stimulus setting and setting 2, the 'enriched' stimulus setting. These two factors, Diagnostic Category and Environmental Setting were examined as to their individual and interactive impact on the children's Behavior, Attention, Affect and Learning Performance.

The children in each of the four diagnostic categorizations, who did not have pre-experimental sampling equivalence, were first randomly selected and divided in half and then observed in one of the two learning settings. This was followed by a comparable observation of each child in the second learning setting. To examine these factors, a 2 within 4 analysis of variance and covariance with repeated measures was performed.

The order in which each child was exposed to each of the settings was counterbalanced in order to reduce the error attributable to order. In this regard, on Observation Period 1, one half of the randomly selected children from each of the four diagnostic categories was exposed to setting 1, while the remaining one half of randomly selected children in each of the four groups was exposed to setting 2. Six weeks later, on Observation Period 2, those children who were initially exposed to setting 1 were introduced to setting 2, while those who were initially in

setting 2 were observed in setting 1.

In terms of data analysis, data was inspected to see whether it met the assumptions of the analysis of variance regarding equal variance between groups and the normal distribution. In this regard, where necessary, variables in need of transformation were given either an arcsin transform or square root transform. Where appropriate, analysis was conducted with the transformed values of the variables. Repeated measure ANOVA's by setting and between groups were performed for each variable during each task. For all variables significance was defined at the .05 level of probability.

Study Population

The children selected for the study were 40, 8-9½ year old children currently enrolled in the New York City Public School System. The children included 10 each from four separate types of classes; three from a 'special education' program and one from the 'regular' school population.

Special education programs include children who evidence a wide variety of learning problems as has been discussed in the first section of the study. The children selected reflected a cross section of children categorized as 'handicapped' according to the design literature and had the following Board of Education designations:

1. Trainable Mentally Retarded (TMR)

2. Neurologically Impaired-Emotionally Handicapped (NIEH)
3. Health Conservation (Learning Disability) (HC 30)
4. Regular Class

The children were predominantly male, reflecting the ratio of males in special education enrollment and were racially divided between lower-middle class White, Black and Hispanic children. Socioeconomic level was determined as a function of the child's parents' occupation and geographic location of home.

Trainable Mentally Retarded (TMR)

Children in the general category of 'mental retardation' are divided into four groupings and ranked in terms of the child's intellectual performance on standardized IQ tests as well as the child's adaptive functioning -- referring to the child's effectiveness in meeting the standards of their age and cultural group in terms of independence and social responsibility according to criteria outlined by the American Psychiatric Association (DSM III, 1980).

Children categorized as 'mentally retarded' fall into four subtypes. Those classified as 'mildly mentally retarded' and referred to as 'educable' have mild adaptive difficulties and an IQ that falls within the 50-70 range. They include approximately 80% of the 'retarded' population. Those categorized as 'moderately mentally

retarded,' and referred to as 'trainable,' have moderate problems in adaptive functioning and have IQ's that fall within the 35-49 range. They consist of approximately 12% of the retarded population. Children with severe problems in adaptive behavior as well as IQ's that fall within the 20-34 range, are referred to as 'severely mentally retarded' and include approximately 7% of the retarded population, while children who exhibit profound problems in adaptive functioning and whose IQ's are below 20 are categorized as 'profoundly retarded.' This grouping consists of approximately 1% of the population of the retarded.

Children selected for this study were categorized as 'moderately mentally retarded.' These children are typically viewed as needing moderate levels of daily supervision as they require assistance in dressing and grooming, maintaining proper eating patterns, using money, traveling independently, etc. Academically, children in this grouping rarely progress beyond the second grade level of achievement. Behaviorally children in this grouping are viewed as generally cooperative in class, relatively interested in their surroundings and usually motivated to learn. Children in this grouping do not typically display significant behavioral problems. Depending on the particular class grouping however, oftentimes classes designated as TMR will also consist of children who evidence overactive or hyperactive behavior that is viewed

as secondary to the child's mental retardation. These children will often be highly distractable, restless and impulsive. Teachers will often describe these children as difficult to engage in the classroom because of their attentional difficulties.

Health Conservation 30 (HC 30)

Children categorized as 'learning disabled' are enrolled in classes with the designation of 'health conservation 30.' This designation is the latest in efforts to treat children in this category benignly from a classificatory perspective in that in the recent past these children were stigmatized with class labels of 'minimal brain dysfunction' and 'brain injured.' Historically there have been many misconceptions regarding the etiology and character of children with learning disabilities. From a clinical perspective they evidence deficits in neurocognitive functioning, such as perception and memory which significantly interferes with their ability to academically perform.

These children have a unique set of characteristics that distinguish them from children categorized as 'mentally retarded' and 'emotionally disturbed.' The National Advisory Committee on Handicapped Children in their annual report to Congress in 1968 stated:

> Children with special learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or using spoken or written languages. These may be

> manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems which are due primarily to visual, hearing, or motor handicaps, to mental retardation, emotional disturbance or to environmental disadvantage (p. 48).

Behaviorally children categorized as 'learning disabled' are often described by their teachers as cooperative in class and generally motivated to learn. Some of these children may evidence difficulties in their ability to concentrate and tolerate frustration when stressed academically. Frustration is typical for these children in that despite at least average intellectual ability, they are often unable to perform to their academic potential.

Neurologically Impaired-Emotionally Handicapped Children (NIEH)

Children enrolled in this class are typically characterized by developmentally inappropriate inattention and impulsivity which is viewed as reflective of subclinical neurological impairment with secondary problems related to emotional adjustment. They are of at least normal intelligence and capable of performing at grade level. Teachers report that children in this grouping, however, often do not reach their academic potential in that many of these children often lack motivation to learn. The NIEH designation is an effort at dealing with the emotional difficulties that invariably coexist with a child who has

attentional difficulties.

In significant contrast with children categorized as TMR and HC 30, who tend to be generally attentive, cooperative and relatively motivated, the children classified as NIEH often evidence significant behavioral problems. They are described by their teachers as having difficulty concentrating on tasks and having difficulty organizing and completing their work; acting before they think, shifting excessively from one activity to another and frequently calling out in class out of turn. They are highly distractable and their classwork is often not completed and typically performed in a careless, impulsive manner. Emotional difficulties which accompany these attentional difficulties will often include obstinacy, negativism, labile moodiness, low frustration tolerance and difficulty in accepting criticism and discipline.

Setting and Materials

From the onset of the preparation of the present study the investigator intended to accomplish the goals of the study by conducting the research as part of the ongoing routine of a special education classroom. Board of Education district administrators for the 'handicapped' however, expressed a strong reluctance to such a study in that the environmental alterations required for the research were viewed as unduly disruptive of the ongoing

classroom routine of these special classes. Alternative subject populations, such as those in private schools, was considered, but determined not appropriate in that the research focus was specifically aimed at the public school 'handicapped' population.

In light of Board of Education administrative objections, a small room (12' x 20') within a public school building was obtained. The room was located in the center of the corridor from the classes in which the children in the study were selected. Prior to the research the room had been temporarily unoccupied and was being used for storage of instructional material. Rooms, such as the one selected, were located throughout the school building and were typically used on a regular basis by many of the children in the 'handicapped' classes and periodically used by some of the children in the 'regular' classes for individualized or small group instruction. These settings were oftentimes used as 'resource rooms' by the teachers and students.

With regard to the issues raised in this study, the room was alternately prepared to reflect the two stimulus conditions examined in this study. A significant amount of effort went into making each setting fit comfortably within the overall school atmosphere. Although the settings were designed for purposes of this study, their general character was consistent with the overall atmosphere of the school setting and therefore hopefully did not have an

unfamiliar, experimental quality. Since each of the children had been either exposed to this room or one similar and most probably had either the opportunity to play with or see most of the materials used for the study, each of the settings was viewed as relatively familiar to the children.

The 'Reduced' Stimulus Setting

The 'reduced' setting attempted to reflect an overall reduction in the stimulus properties from that which has been formulated theoretically as being beneficial for the 'normal' child. The setting was characterized as relatively simple, consistent and well defined. The materials selected for the setting were congruent with one another and with the performance demands of the required learning tasks of the study while the arrangement of the furniture in the room reflected definition and order.

Overall, the general character of the setting was consistent with many of the special design considerations formulated by the designers for the 'handicapped' and discussed in detail in Chapter III of this study. For the floor plan and arrangement of materials in the setting see Figures 1-3, p. 54-56, and Appendix A, p. 146 for a List of Materials.

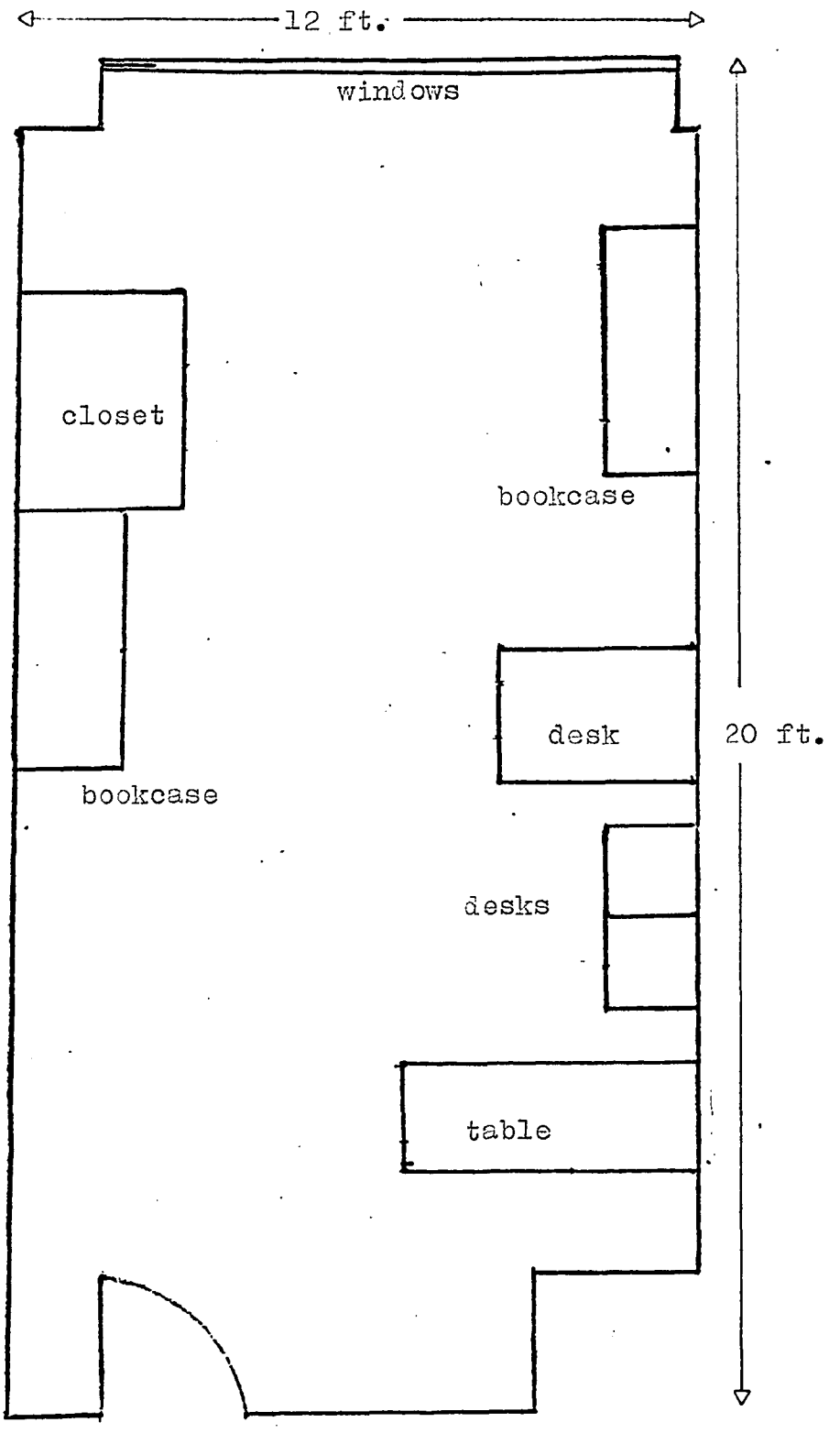


Figure 1. Floor Plan of Reduced Setting

Figure 2. Reduced Setting: Arrangement of Materials (front half of room)

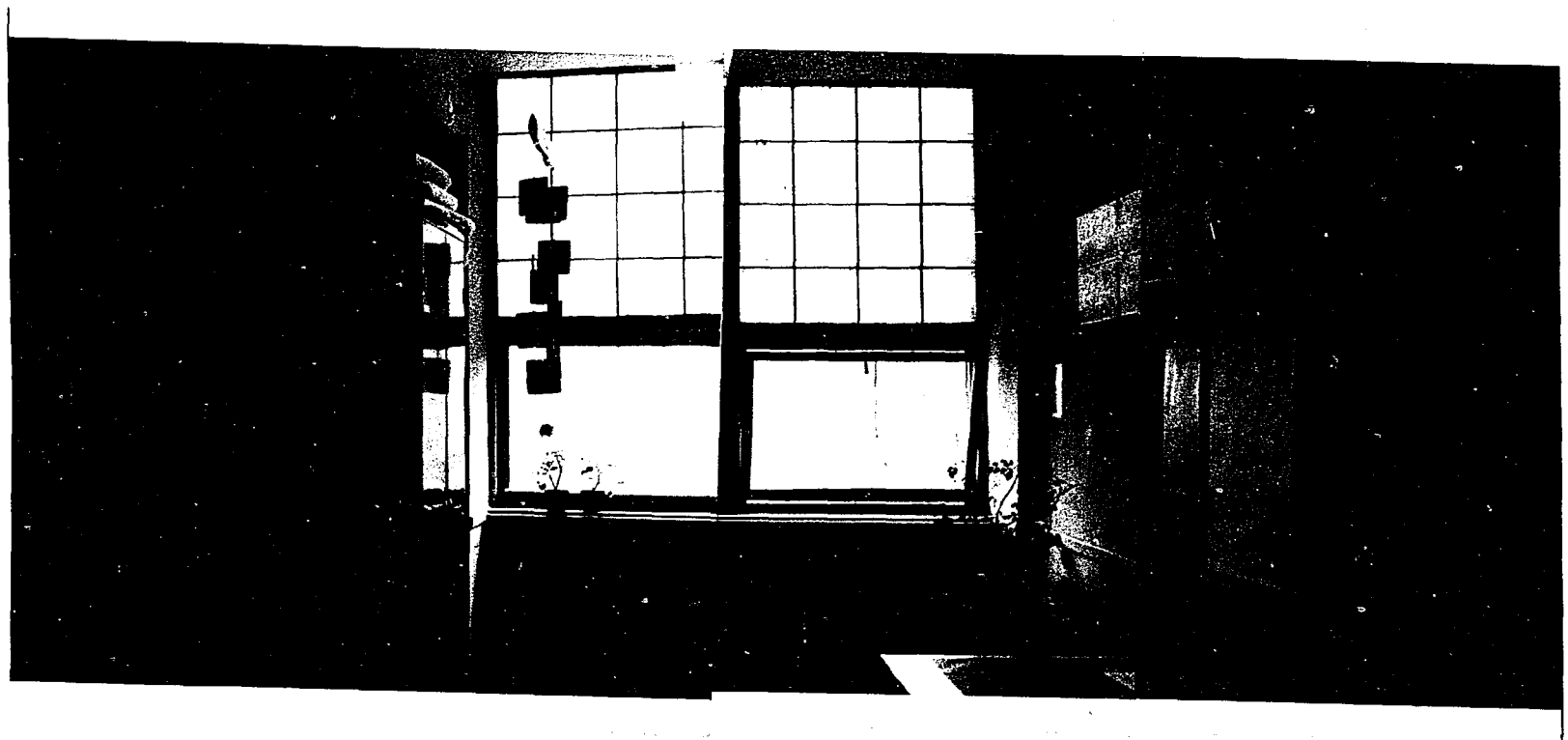


Figure 3. Reduced Setting: Arrangement of Materials (rear half of room)

It should be noted, however, that the character and degree of stimulation was reflective of many 'regular' classrooms observed by the researcher in the preparation of this study and in his other work within the school system. In their design, many of the classrooms for 'normal' children reflect the special design considerations that have been especially formulated for 'handicapped' children. These normal settings are also highly defined and structured and have a minimum of 'extraneous' stimulation that do not pertain directly to formal academic tasks. These observations suggest that the concepts examined in this study have implications for the design of learning settings for all children, regardless of diagnostic classification.

The 'Enriched' Stimulus Setting.

The overall design of the 'enriched' setting was an effort at developing design strategies in accordance with concepts developed in Chapter IV of this study. To promote learning, the setting was designed to stimulate the child's interest and promote interaction. In order to examine the capacity of the 'handicapped' to cognitively manage with the same degree of stimulus conditions as developed for the 'normal' child, attempts were made to make the setting at least comparable, and even more stimulating than settings typically designed for the 'normal' child. Noteworthy was that many of the materials selected for the study were

relatively common to Board of Eduction classrooms and not esoteric in character.

In formulating a varied, complex setting, considerable attention went into formulating a setting that was cognitively comfortable and comprehensible to all children in the study. From a child/environment perspective, the establishment of an objective criteria for optimal levels of stimulation is not possible due to the dynamic quality of the interactive relationship between the child and their environment. As Yarrow (1968) states:

> The intensity, the complexity, and the patterning of stimulation that is optimal will vary at different developmental levels and will depend also on individual sensitivities and vulnerabilities (p.34)

During pilot studies conducted on a matched group of children not in the study, varied stimulus conditions were tested in order to formulate a level of varied, complex stimulation that was highly enriched but not beyond the cognitive processing abilities of the children within the study.

In translating the child/environment concepts developed in this study into specific design strategies, considerable attention was placed on the following six design variables to achieve an evocative, cognitively comprehensible and aesthetically pleasing setting:

1. Varied, Complex Stimulation
2. Interesting Content
3. Varied Textures
4. Harmonious Colors

5. Responsive Materials

6. Proportionally Balanced, Coherent Arrangement

For the floor plan of the 'enriched' setting see Figure 4 (p. 60).

Varied, Complex Stimulation

Research in psychology has consistently demonstrated the benefit of varied, complex stimulation to stimulate a child's interest and promote learning. Stimuli that vary in several dimensions enable the child to develop and consolidate concepts through the processes of assimilation and accommodation (Piaget, 1963, 1969). Researchers have found that in terms of early childhood development, a varied, complex stimulus setting promotes general mental and psychomotor development as well as cognitive skills such as goal directedness and problem-solving (McCall, 1974; Yarrow & Rubenstein, 1975).

In an effort to translate these concepts into practical design strategies certain guidelines were followed in the selection of materials for the study. For the list of materials used in the setting see Appendix B, p. 147.

During pre-tests, certain materials were tried but were found not useful in that they did not promote interest among the kind of children used in the research study. For example, inflatable planes and animals were tried and although they appeared to evoke interest in some of the

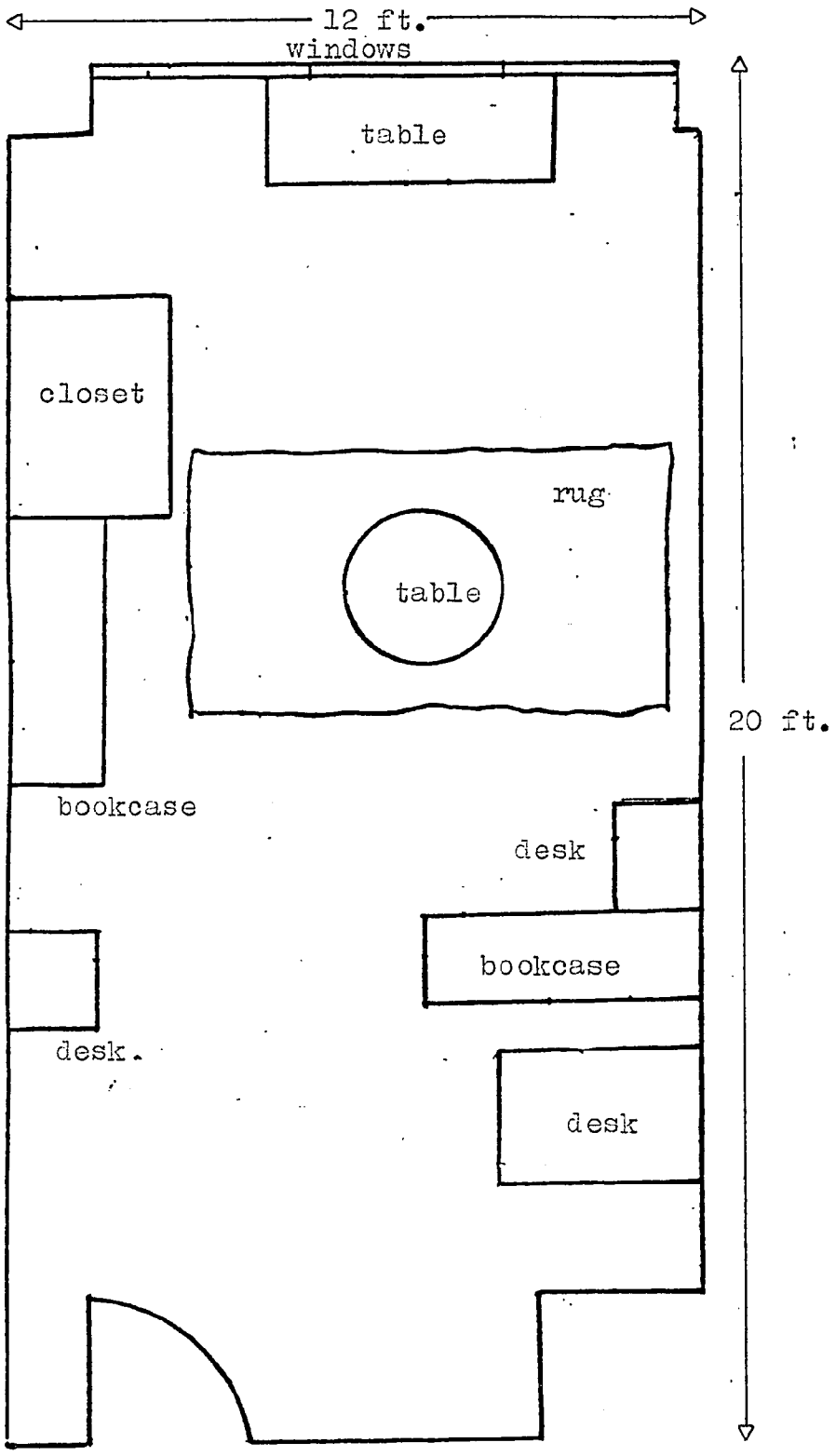


Figure 4. Floor Plan of Enriched Setting

children, others in the study found them to be 'babyish.' Plastic models of animals, cars, etc. were not attended to while a variety of posters, whose themes were specifically directed towards children (i.e. Star Wars, Super Heroes) were often unnoticed. In this light, the determination of materials in the 'enriched' setting followed an evolving selection process wherein materials eventually selected were based on the degree to which they promoted interest and behaviors conducive to learning among the kind of children selected for the study.

Noteworthy is that the final selection of materials for the setting is not viewed as a check-list of materials that would necessarily generalize to other populations. Rather, the significant issue that emerged is the importance of adhering to an evolving selection process in which the selection of materials should be assessed in terms of the degree to which they promote interest and learning among the children who use them.

Attention was aimed at making the setting a non-frustrating environment that would encourage and support exploration and learning. Materials were chosen that promoted interaction and were consistent with the children's abilities in the study. Since the children covered a wide range of intellectual talents, the materials were selected in terms of their relative 'open-endedness,' with none of the materials requiring a level of academic achievement, but rather offering the child experiences of

accomplishment and mastery at whatever level the child approached the material. Though the children reflected varying cognitive skills, all of them would be potentially able to derive satisfaction from their interactions with the setting.

Stimulation in the 'enriched' setting varied in terms of its content, texture and color while the complexity of the setting was viewed in terms of its stimulus properties; as a function of the character of the materials and the number of stimulus options they offered as well as of the general environmental context.

Interesting Content

The setting consisted of a wide range of materials that were aimed at the interests of latency age children. The choice of subject matter was viewed as an essential component in stimulating the child's interest, facilitating interaction and promoting behaviors that were consistent with learning.

The setting was divided into separate areas which included materials related to specific themes, such as 'astronomy' (globe, photographs of solar system, rocket ship), 'anatomy' (skeletal models of skulls and body, anatomy posters), and 'science' (magnets for magnetism and batteries for electricity models). The 'nature' section consisted of materials related to water (dry plants, pictures of trees, fish swimming in fishbowl, and a

flowering plant) while the fantasy area consisted of posters depicting the children's favorite monster heroes (Frankenstein, Dracula, Wolfman). See photographs of setting in Figures 5-8 (p. 64-67).

Varied Textures

The setting varied in terms of the visual and tactile qualities of the materials. In accordance with concepts developed in this study, varied textures were viewed as an evocative design element; one that would stimulate a child's tactile sense, encouraging a child to 'feel' and make contact with their environment either through seeing or touching materials in the setting.

The varied, textured setting was achieved by utilizing materials that differed in terms of their characteristic physical structure, including their size, shape and composition. Variety of textures was within as well as between each topic area. For example, in the science area, the magnetism display consisted of horseshoe shaped magnets, nails, metal keys, wooden buttons, and sea shells; the nature display included a glass, water filled fishtank, wooden tinkertoy boat, flowering plant in straw woven basket and dry plant leaves.

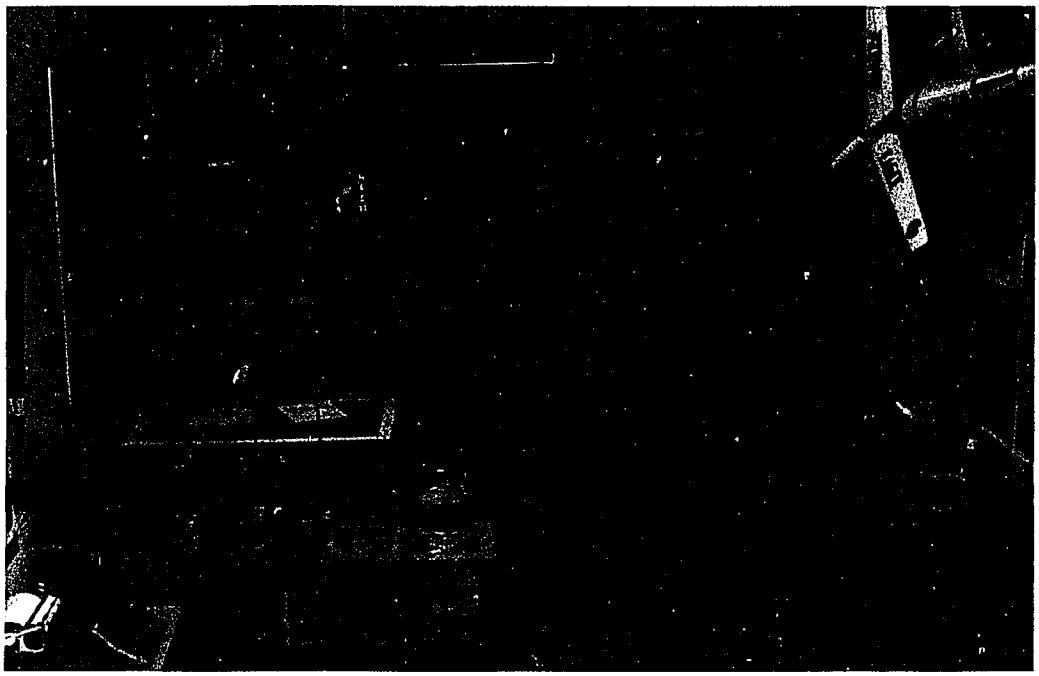


Figure 5. Enriched Setting: Arrangements of Materials (front half of room)

Figure 6. Enriched Setting: Arrangement of Materials (rear half of room)

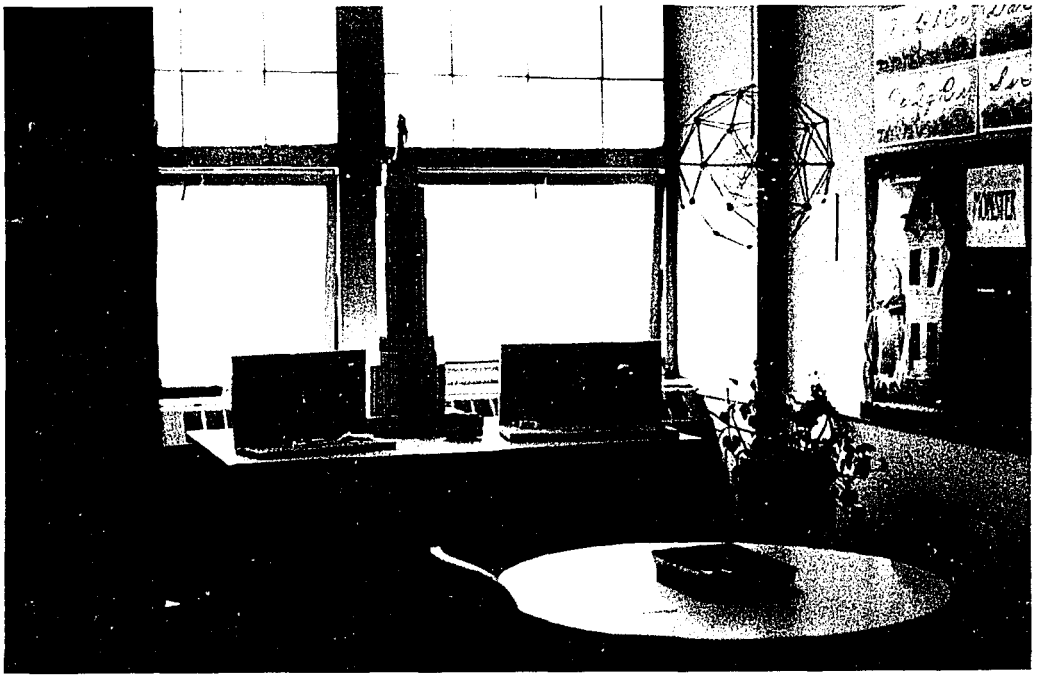


Figure 7. Enriched Setting: Display of Materials

Figure 8. Enriched Setting: Wall Displays

Harmonious Colors

In an effort to formulate a setting characterized by harmonious colors that was not based on subjective attitude but rather objective principles, concepts developed by Itten, a prominent Bauhaus colorist, was utilized (1948). In developing his concept of color harmony, Itten related to the phenomena of successive and simultaneous contrasts as suggestive of a state of equilibrium and balance when a complemental relationship is established between two or more colors. He refers to these phenomena as the basis of color harmony and balance in that the eye psychophysiologically requires any given color to be balanced by its complement such as red-green, blue-yellow, etc., with each color in a complemental relationship with another depending on its location in the natural spectrum. He relates that the eye is in harmonic equilibrium when such a complemental relationship between colors in achieved.

The color scheme of the 'enriched' setting was formulated in accordance with these principles. In light of the fact that the room was painted a bluish/green, it had to be accepted as a major given in the overall color scheme of the room. Two complemental colors of blue/green were selected; red/violet and orange/yellow in order to achieve a harmonious color triad that was consistent with Itten's principles. The colors of the setting were selected in accordance with these concepts of color harmony and are illustrated in Figures 9-11 (p. 69-71).

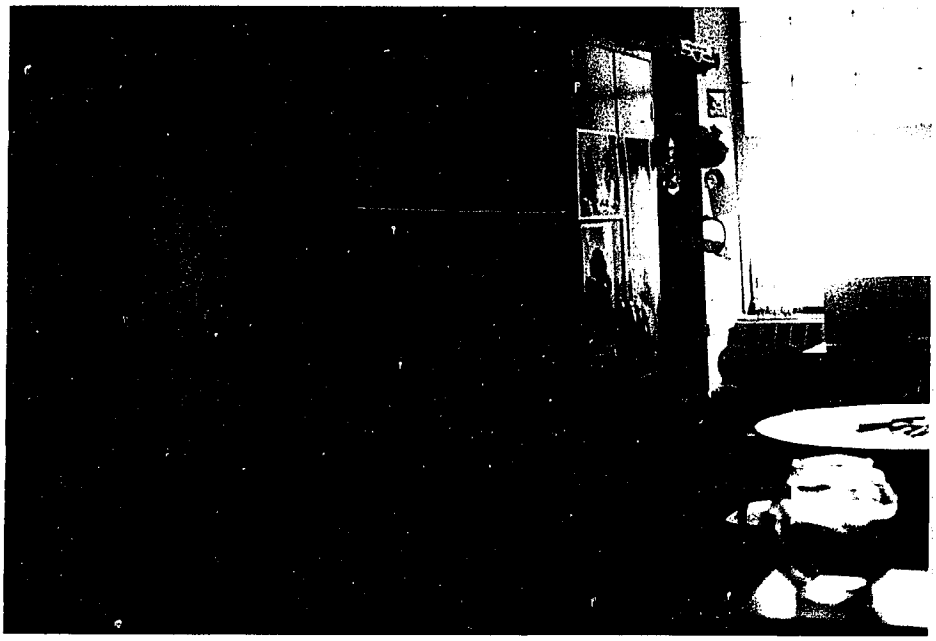


Figure 9. Enriched Setting: Display of Materials

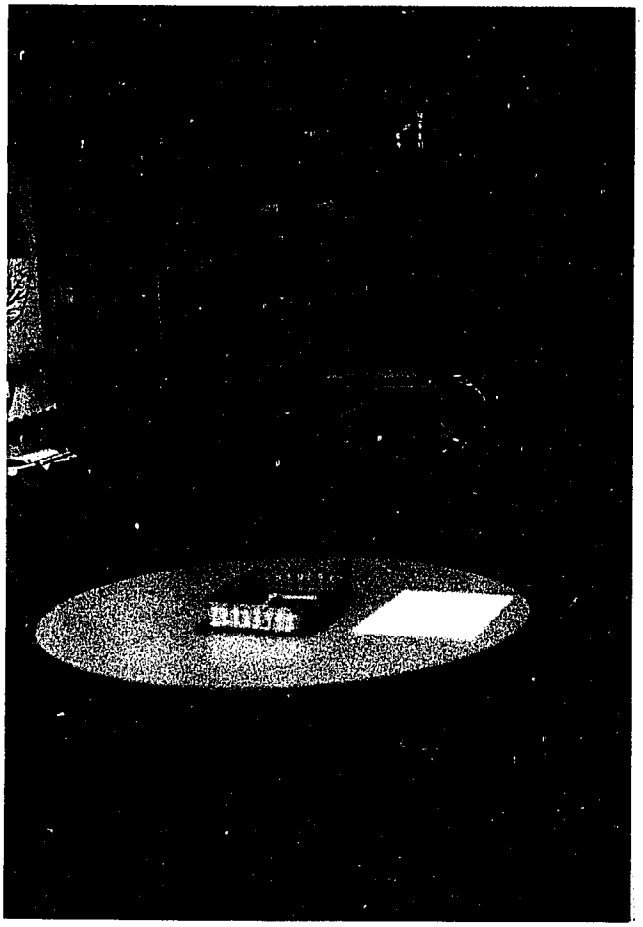


Figure 10. Display of Materials
Enriched Setting

Figure 11. Enriched Setting: Display of Materials

Responsive Materials

In terms of the child/environment concepts developed in this study, of central importance was the capacity of the physical setting to promote and support interaction. Materials that are 'responsive' to a child's actions promote interactions by offering the child opportunities to have an 'effect' upon their environment. Research findings support the benefits of such a responsive setting and have found that responsibity of toys for very young children was related positively to gross and fine motor development, as well as to cognitive motivational functions such as exploration and goal directedness (Bradley, 1967; Caldwell, 1967; Yarrow, 1978). Research examining the effects of contingent feedback from the physical environment similarly support the view that responsive materials are motivational and promote learning (Finklestein & Ramey, 1977; Rovee & Rovee, 1969; Watson & Ramey, 1972).

The specific materials selected for the study were chosen in part, in terms of the degree to which they were responsive to a child's actions. In this light, the setting consisted of materials that ranged in terms of their responsivity, from materials that were minimally responsive, such as wall charts and posters to highly responsive materials such as the electricity model, typewriter, 3D viewer and magnetic display.

Proportionally Balanced, Coherent Arrangement

To promote cognitive mastery of the setting, a proportionally balanced, coherent arrangement of the room was viewed as especially significant. Such an arrangement was seen as facilitating the child's ability to abstract from the space a comprehensible, cognitive pattern that enabled the child to organize their spatial experience and develop cognitive grasp over their setting.

To achieve this goal, the setting was formulated in terms of offering the child varied, complex stimulation within an atmosphere of consistency and order. Materials were arranged in proportional relation to one another and to the overall whole setting in terms of their size, weight and composition, with their placement in accordance with an aesthetically pleasing, integrated whole. Design strategies were directed at producing a sense of equilibrium, with the elements of the setting in a harmonious balance.

For example, the spatial dimensions of the room made the setting appear disproportionally too long and linear. To offset the linearity of the space and establish a better proportional balance, efforts were made to bring into the setting width and circularity. A circular table atop a horizontally placed rug, served as the central focus of the setting and was encircled by varied stimulation. The circular table was viewed as having a concentrating effect, making the somewhat disparate and inconsistent materials in

the setting fit into a meaningful whole.

Bookcases and closets aided in redefining the spatial dimensions in more balanced terms as well as creating private corners and varied spaces. To promote organization of the varied stimulation, materials were placed in accordance with their relationship to particular content areas. These spaces were clearly defined and arranged in a logical rhythmic pattern. Each of the topic areas had a thematically coherent, varied though proportional arrangement characterized by novel juxtapositions of relatively familiar materials. For example, the nature area consisted of materials that were selected and arranged conceptually in terms of their dependence on water. In this regard, the display shelf included a glass fishbowl, a tinkertoy sailboat, and a plant. The fishbowl and plant container were both circular and of equal scale and proportion and balanced spatially on each side of the tinkertoy sailboat.

Each section differed from one another in terms of materials and how they were arranged. In developing an organized, coherent space, efforts were made to have each of the topic areas of similar size and in proportion with the overall dimensions of the room and the height of the children. Their placement was determined in terms of each particular topic area as well as in terms of the overall setting as a whole.

With regard to the general setting, materials that were suspended (rockets, planes, plants, mobiles), hung on

walls (posters, charts, photographs) and displayed on shelves (models of the body, musical instruments, fishtank) were arranged in an aesthetically pleasing, proportional balance to one another. In this regard, much attention went into making each topic area coherent within itself as well as fitting comfortably within a well integrated whole setting.

Techniques and Measures

This study empirically explored the issues raised in this research during two learning situations that attempted to capture the character of a classroom routine. During an unstructured (uns) time period the child was without programatic structure and was free to spend their time in any way they chose. This period reflected a time in a regular classroom setting when there would be brief transitional breaks between formal academic lessons when the child could involve themselves in quiet play. The structured (s) time period reflected the more traditionally structured programatic character of classroom routine. During this time the child was required to perform four learning tasks that tapped the major learning models typically utilized in a classroom setting.

The 'uns' and 's' times were utilized for this study to examine the behavior of children between the groups and to assess the impact of the setting on the child's behavior

and learning. These issues were assessed in terms of the following measures:

1. Behavior
2. Attention
3. Affect
4. Learning Performance:
    - Ideational Fluency
    - Diversity of Themes
    - Trials to Learn
    - Recall

To record the child's Behavior, Attention and Affect, a Time Sampling technique was utilized with observations of the child every 20 seconds.

Behavior

In light of the issues examined in this study, the Behavior of the children was clustered into the following six categories:

1. Exploratory Behavior
2. Non-Exploratory Behavior
3. Non-Adaptive Behavior
4. Task-Related Behavior
5. Non-Task Related Behavior
6. Other

Significant efforts was made to capture the quality of the child's predominant behavior at the time of each observation. For example, if during the unstructured

period the child was observed to be 'playing with a magnet and tapping their foot,' the primary behavior was viewed as 'playing with a magnet,' and interpreted as an Exploratory Behavior.

During the four learning tasks, the children were rated in terms of their task relatedness on a Task-Related Scale which rated children as either Task-Related or Non Task-Related.

Each behavioral category is described below.

Exploratory Behavior. This behavior was defined as either 'passive' or 'active' behaviors characterized by observable attentional interest that was directed towards a particular feature of the setting. 'Active' behaviors were defined as those in which there was motor involvement such as 'touching' a magnet, 'drawing' on a piece of paper, etc., while 'passive' behaviors were viewed as receptive expressions of interest in the environment. Oftentimes passive behaviors would be utilized by children who either do not generally initiate activity by themselves but rather who respond to overtures from the environment or by children who were prone to explore but do not because the environment lacked sufficient interest and challenge.

In that these receptive behaviors reflected an internal process that was not observable, this study was concerned only with sustained 'looking' behaviors that were clearly observable and directed toward an element in the

setting, such as 'looking out the window,' 'looking at a poster,' etc.

Non-Exploratory Behavior. Behaviors in this category were characterized as having no apparent attentional focus. These behaviors included 'standing' and 'sitting.' For example, during the unstructured period, some children would sit impassively, apparently waiting for the return of the teacher to the setting. 'Standing,' 'sitting,' and these 'waiting' behaviors, were categorized as non-explorative in character.

Non-Adaptive Behavior. This category refers to behaviors which evidence difficulty in the child's ability to effectively adjust to environmental conditions. It includes 'idiosyncratic' and 'regressive' behaviors.

Behaviors referred to as 'idiosyncratic' are defined as those which are peculiar and unique to the child. These behaviors are typically viewed psychologically, as indicative of poor adjustment to a situation. Behaviors in this category may include odd, strange sounds and gestures.

'Regressive' behaviors include those that typically reflect adaptive coping strategies of a child at an earlier age than their stated years. Behaviors in this subcategory include, 'thumbsucking,' 'talking to self,' etc.

Task-Related Behavior. If during the required

learning tasks the child's behavior was consistent with the requirements of the particular task, the child's behavior was rated on the Task Related Scale, as Task-Related.

Non Task-Related Behavior. The child's behavior was rated as Non Task-Related if their behavior was clearly not consistent with the performance demands of any particular learning task.

Other. Includes behaviors not covered by existing categories.

Attention

Central to the concepts developed in this study is the degree to which the setting can promote attention. Schachtel (1959) discusses the essential importance of attention as a prerequisite for determining reality as well as the foundation for all learning. By focally attending, the child is able to grasp their observable world - to come into contact with objects in the environment. The degree to which the environment can faciliate focal attention, is a significant indication as to the capacity of the setting to engage the child and promote learning.

Children were rated in their Attentional Behavior depending on their capacity to display directed focal attention on a particular object in the setting. In that 'attention' is a cognitive process that is non-observable

and must be inferred from observable behaviors, the descriptive categorization of Attention was based on easily observable behaviors and determined by the extent to which the child sustained focal eye contact on a particular element in the setting.

Each child was categorized as either Attentive or Inattentive during the unstructured period and each of the four learning tasks. Each categorization was based on a rating of Attentive or Inattentive on at least 75% of the observations during each of the periods of the study. In the event that a child did not display predominance in either category, the child was categorized as Mixed Attentive.

Each categorization was defined in the following manner.

Focal Attention. This rating was characterized by attention that was directed toward a particular element in the setting, as manifested in sustained eye contact for at least 3 seconds. Although a child may be directed towards an internal object, such as a feeling or thought, in that these were non-observable, the study focused on attention that was externally directed.

Inattention. This rating was utilized when the child evidenced a lack of directed attentional interest as manifested by an absence of sustained eye contact on any element in the setting.

Affect

The perspective developed in this study views the child's inherent interest in their environment and wish to explore and learn as significantly related to the child's affective state; with interest and exploration promoted by states of calm well-being, while disinterest and lack of exploration characterize the person who is restless and anxious. In light of the relationship between affect and learning, the present study recorded the child's affect in each of the two learning settings. The degree to which the environment could promote feelings of Calm was viewed as reflective of the capacity of the setting to promote learning.

In that Affect is a subtle dimension and difficult to effectively categorize with constant reliability, the scale utilized for this study was based on affects that were globally defined and relatively easy to determine. The Affect Rating Scale included the following categories:

Enjoyment. This affect was characterized by broad smiling, laughter, verbal or body expressions of delight and joy.

Calm. An affective state characterized by relaxed, untroubled contentment that suggested a satisfied mood.

Apathy. Affect characterized by boredom and indifference as displayed in verbal and body expressions.

Restless. Affect characterized by restlessness and impatience and typically manifested in fidgeting, tapping

and other overactive motor behaviors.

Learning Performance

To assess the learning performance of each group as well as to examine the impact of stimulation on learning, the children were required to perform a variety of tasks in each of the two settings. Each task tapped a different type of learning used in the classroom. Figure 12 below, illustrates the three types of learning with their related tasks and the measures that were utilized to assess the child's performance.

Types of Learning	Tasks	Learning Performance
Cognitive Learning	Task 1 Story	Ideational Fluency Diversity of Themes
	Task 2 Drawing	Diversity of Themes
Behavioral Learning	Task 3 Instruction	Degree of Attention Affect
	Task 4 Construction	Trials to Learn
Incidental Learning	Memory of Materials in Setting	Recall of Materials Unique to Setting

Figure 12: Learning Performance: Types of Learning, Tasks and Measures

Cognitive Learning: Tasks

Cognitive learning presumes learning to be a highly active process, with the child seeking information rather than responding to a teacher's prepared instructional presentation. In this model of learning, the child is taking an active, inquiring role and involved in formulating and testing hypotheses about the manner in which a goal can be reached. This method of learning places the decision making aspects of learning onto the child and is an effort to promote the child's judgement, creativity, fluency and flexibility of thought and mental imagery. In this model, the teacher is viewed as a facilitator in the child's learning and not as the pivotal source of all information the child is to learn.

In terms of present study, cognitive learning was examined in terms of the following two tasks:

Task 1: Make-Up A Story. This task involved asking the child to make-up a story about any topic they wanted. The task was unstructured and was given to assess the degree to which the character of the setting influenced the child's responses. In the likelihood that a child was unable to compose a story, in order to avoid frustrating the child, a simple topic, such as 'what will you do on your vacation' was suggested. In this regard, attention was made to have each child experience themselves as effective in each of their learning efforts.

In that children vary in terms of their preferred

means of communication, the story was selected in that it maximized the performance of those children who preferred to express themselves verbally. The child's performance was assessed in terms of the degree of creative, imaginative thought expressed in the story.

Task 2: Draw A Picture. This task, like the 'story' was unstructured in format, with the child asked to draw anything they wanted. As with task 1, the 'drawing' was utilized to assess the impact of the settings on the character of the child's productions. This task provided children who had a preference for perceptual-motor functioning, the opportunity to express themselves creatively through motoric expression. If the child was unable to develop an idea, to avoid frustration, an idea, such as 'draw a picture of a person' was suggested.

Cognitive Learning: Measures

The child's learning performance was assessed in terms of the following measures:

Ideational Fluency. This measure, which related to the 'story' task, was defined as the number of non-redundant ideas within each child's story. This measure was utilized in order to tap the child's mental imagery, divergent creative thought and verbal expressiveness.

Diversity of Themes. This measure tapped the children's performance in the 'story' as well as in the 'drawing.' In contrast to Ideational Fluency which tapped

the mental imagery of individual children, this measure was determined by the total number of different themes that were expressed by each of the four groups in their stories and drawings (i.e. baseball, movies, cars, television shows, etc.). In terms of the group's capacity to express a Diversity of Themes, this measure tapped the capacity of each setting in promoting mental imagery within as well as between each of the two learning settings.

Behavioral Learning: Tasks

In contrast to the cognitive model of learning which is often identified with the 'open classroom,' the Behavioral approach to learning is reflective of the more traditional approaches to instruction. In this model, the child is viewed as a relatively 'passive' recipient of instructional information, with the teacher the pivotal source of instruction. This perspective precludes the child from taking a more active, inquiring posture as to the acquisition of knowledge. Traditionally, the basic academic skills, such as reading, arithmetic, writing, etc., have been taught by this approach.

The essential principles of this model include the following:

1. The teacher breaks down the subject to be taught to an ordered sequence of steps.

2. The teacher provides a means for the child to respond in a specified way to each step and to record the

response.

3. The teacher reinforces the child's response by providing immediate knowledge of the results.

4. To ensure that the child will make few errors, the teacher makes each sequential step very small.

5. The teacher assists the child step by step from what is known to what should be learned.

To assess the stimulus impact of the settings on Behavioral Learning, each group's performance on two tasks was evaluated. In task 3, the 'instructional task,' the child was instructed as to how to make a paper tree or ladder, while in task 4, the 'construction task,' the child was required to construct the tree or ladder which they had been taught in task 3. Both of these tasks are inherently interrelated and reflect a single learning process wherein the child is required to demonstrate skills based on what they have been formally taught.

The learning task chosen for this study, the making of a paper tree or ladder, is not a traditional academic task. It was chosen however, in that it involved the same basic learning processes involved in the development of academic skills. Performance of the task was not contingent on academic achievement, such as reading, spelling or arithmetic skills, but rather on cognitive and adaptive capabilities which are fundamental to academic learning. This learning task tapped each of the major sensory modalities that the child utilizes in processing informa-

tion including the visual, auditory, and tactile, as well as cross-modality learning, such as visual-motor and auditory-motor functioning. A complete description of the learning tasks is found in Appendices C and D, p. 149-152.

The particular learning task chosen was viewed as relatively novel to each child and as a result, performance was not a function of familiarity. Moreover, the task was selected in that it would provide motivational interest to each child and not induce excessive frustration. Overall, the task was viewed as comparable to tasks learned at school and thereby would capture aspects of the teacher-student learning situation. A description of each task follows.

Task 3 Instructional Task. This task reflected a typical, everyday teacher-student situation wherein the child was formally taught by a teacher a set of instructions in order to learn how to perform a particular skill. During this task the child was taught a series of sequential steps that the child was to follow in order to successfully construct a paper tree or ladder.

Task 4 Construction Task. During this task the child was required to construct the tree or ladder that they had been taught during task 3. Whereas task 3 was a passive task that required the child to receptively process information as to how to perform the task, task 4 was active in that it required the child to 'act' on what they had learned.

In terms of Behavioral Learning the child's learning performance was measured in terms of the following:

Behavioral Learning: Measures

Trials to Learn. The child's performance on task 4 was based on how many trials a child required in order to successfully complete the entire task without an error in the procedural sequence. In this regard, the lower the number of trials, the faster the learning.

Incidental Learning: Task and Measure

A third type of learning is not the result of a directed effort by a teacher, but rather as a consequence of the child's involvement with their environment. This learning is not the result of a planned curriculum or creative exercise but rather is the result of a child's everyday interactions. This model of learning was included within the study to assess the influence of each stimulus setting on the child's ability to informally glean information from their surroundings.

With regard to measuring Incidental Learning, upon completion of the required tasks, the child was asked to play a game in which they were to close their eyes and remember as many of the things that were in the room as they could. The children's responses were recorded in terms of the following categories, with Incidental Learning scored in terms of the fourth measure.

1. The child recalls features of a typical classroom setting such as walls, chairs, doors, desks, etc.

2. The child recalls people such as the teacher, observer, or themselves.

3. The child recalls materials related specifically to the required learning tasks such as a newspaper, scissors, tape, etc.

4. The child recalls materials specific and unique to each of the prepared settings.

Interviews

In order to derive qualitative data regarding the child's behavior, interviews were conducted with each child. The questions were directed at exploring the child's overall feelings and aesthetic sensibilities regarding each setting as well as their notions of their own classroom and of classroom design in general.

The interviews included the following questions:

1. How would you describe this room that we're in to another friend of yours?
2. What do you like about the room? Why?
3. What do you not like about the room? Why?
4. If you could put anything you want into your own classroom to help you learn, what would you put in it? Why?

5. If you could have your classroom look like this room (referring to the particular stimulus setting that the child had just left), would you want it? Why?

Procedure

The total 40 children in the study were divided into four equal groups according to Diagnostic Categorization. During Observation Period 1, five randomly selected children of each group were observed in the 'reduced' setting 1 while the remaining five children in each group was observed in the 'enriched' setting 2. Six weeks later, during Observational Period 2, each child was observed in the alternative learning setting.

On the day prior to the formal observations, each child was introduced by their own teacher to the teacher/researcher as a 'part-time teacher' who was in the school for a project to teach some interesting things to children. The researcher was a former special education teacher who had had prior experience teaching children with multiple handicaps. At that time the teacher/researcher said to each child, "Hi, my name is Ms. Pollack, and I'll be doing a project in the school and you'll be one of the children who'll be helping me. I'll be asking you some questions and teaching you some interesting things as part of my project. We'll spend about 15 minutes together in a different room tomorrow -- so I'll see you tomorrow, O.K."

On the day of the observations the teacher/researcher picked the child up at their classroom and escorted them to the prepared learning setting. Upon entering the setting, the teacher introduced the recording observer to the child as a teacher with whom she shared an office -- and said "This is Mr. Sharpe, he shares an office with me. He'll be working in this office while we're here." At this time the recorder greeted the child. Following this introduction, the teacher said to the child, "As I told you yesterday, we're going to play some games together but before we begin I have to take care of some things at another office for a few minutes -- so until I come back you can play with anything in the room."

Exploratory Behavior

From the time the teacher/researcher informed the child that they could play with anything in the room, the observer recorded the child's behavior every 20 seconds for the following 5 minutes. During this period, if the child chose to talk with the observer, the observer responded accordingly, though did not initiate or stimulate further interaction. At these times the observer made efforts to redirect the child's attention onto the prepared learning setting. The observer, who recorded the child's behavior as unobtrusively as possible, was seated in the far corner of the room, opposite but facing the child.

Cognitive Learning

Upon returning to the room, after five minutes, the teacher/researcher said to the child "Hi (name of child) -- let's sit down over here together -- we're going to do a few things together today that will take about 15 minutes and after that you'll be able to go back to your classroom -- one of the things I wanted to do is play a game with you called 'let's pretend' -- the way you play it is that you make up a story about anything you want -- you tell it to me and I'll write down everything you say."

If the child was able to spontaneously make up a story the teacher proceeded with writing down the story as told by the child. If the child was unable to make up a story, the teacher said "I have an idea for your story -- let's pretend that your teacher said that next week was going to be a vacation and you could do whatever you want -- also during this vacation time your parents decided that you could do whatever you want -- make up a story by using your imagination about what you would like to do. You tell me the story and I'll write down everything you say." If the child displayed reluctance with the imagination task, the teacher said "remember, in this story you could do anything you want to do -- there must be some things you enjoy doing -- use your imagination -- give it a try."

Upon completion of each story the teacher said to each child, "That was a really good story -- I'd like to keep this story that you made up but if you want a copy for

yourself, I can make up another copy and give it to you later in the week."

Following the storytelling task, the teacher said to the child, "I'd like you to use your imagination again, but this time I'd like you to draw a picture of anything you like -- you can use this paper and the pencils, markers or crayons on the desk." If the child was unable to spontaneously draw a picture, the teacher said, "If you can't come up with an idea of what to draw -- how about something in this room or a picture of a person." Throughout the storytelling and picture-drawing tasks, the teacher was supportive of the child's imaginative and creative efforts.

Behavioral Learning

Upon completion of the 'cognitive' learning tasks, the teacher said to the child, "The next thing I wanted to do with you today was to make this together." At this point the teacher displayed to the child either the tree or ladder, saying, "I'm going to teach you how to make one of these today." (Instructions to make the tree/ladder, see Appendices C and D, p. 149-152).

With the completed folded task as a guide, the teacher explained and simultaneously demonstrated the task to each child by breaking down each task into a sequence of steps. Following the explanation and demonstration trial the child was asked to try the folding task alone without assistance

by saying, "Try to do this yourself this time." The child then proceeded with the folding task, with the teacher orally counting off each step as the child passed it successfully. If the child missed the correct fold at any step in the sequence, the teacher recorded it as a mistrial and said to the child, "Good try, but that fold isn't quite right, give it another try." After the second missed attempt, the teacher, who had a series of models of each procedural fold available, showed the child a demonstration model of the folding task that would indicate the proper fold at the particular step at which the child missed.

At this time the teacher said to the child, "Here's a practice model with the correct fold, can you fold it just like this one." Each child was given 5 trials at making the correct procedural fold in any given step. During each missed trial the teacher supportively encouraged the child's efforts. If the child was unable to correctly fold the paper afer 5 attempts, the teacher recorded this as a 'failed' step and then assisted the child in making the appropriate fold.

In the event that the child's frustration tolerance was reached rapidly and she/he either expressed or displayed inability to persevere with the folding task before 5 attempts in any given step, the teacher recorded this as a 'failed' step (corresponding to 5 missed trials) and the teacher assisted the child in making the corrected fold and then proceeded to the next procedural step. If

the child expressed total inability and/or lack of interest in completing the entire folding task and chose to 'give up,' the teacher made supportive efforts to encourage the child to continue, though was supportively accepting if the child did not wish to comply with the learning task. In the likelihood of this possibility, the teacher recorded the child's effort as a 'failed' sequence and recorded the child in accordance with how many trials the child had completed prior to stopping the task and recorded the child as 'failing' each successive step that was not attempted.

In order to provide each child with an overall successful learning experience, the final folding task, a simply folded airplane, was sufficiently easy so that all the children in the study would be sucessfully able to construct an object.

Incidental Learning

After completion of the Behavioral Learning task, the child was asked to participate in a final task. The teacher said to the child, "The last game that we're going to play is one that you have to close your eyes for -- in this game, without looking, you have to try to name as many things in this room as you can remember -- remember you cannot peek -- try to remember as many things as you can -- close your eyes, and I'll put this blindfold over your eyes to make sure that you cannot see -- after the blindfold is on, you can start naming the things in the room." Upon completion

of this task, the teacher positively thanks the child for his efforts and commends his work, "(Child's name), I hope that you enjoyed the games we played together -- I liked being with you -- you did very well today."

Interview

Upon completion of all the tasks, the child was interviewed by the teacher, who said: "Before we go back to your classroom, there's just a few more questions I'd like to ask you, O.K.?" The teacher then proceeded to ask the child each of the five interview questions.

Overall, throughout the learning tasks, the teacher attmpted to convey to each child the expectation of their attentive involvement with the required learning tasks, though not detering the child's option of choosing an alternative activity. If the child displayed inattention to the required tasks, the teacher attempted to redirect the child to the tasks in a mild, non-reprimanding manner by stating, "We have to finish these folding games today -- so let's continue with them now." Emphasis of the statement was on the expectation of what the child was to do in the prepared setting and not a statement directed at limiting the child's behavioral options. If the child demonstrated continuous inattention, the teacher, periodically, at their own discretion, attempted to mildly redirect the child's focus in a non-demanding, supportive manner and not make any statement nor gesture that could be

construed by the child as a disciplinary demand to participate in the required tasks.

Training and Reliability

Prior to the formal observations, the teacher and observer practiced the observational techniques in each of the two settings. This was useful for piloting instruments and for obtaining reliability and also familiarized the children with their presence in the school.

Interobserver reliability was obtained for the Time Sampling technique with two judges, with one participating in the formal study. The overall interobserver agreement among the two judges was 95.3% in Behavior, 96.1% in Attention, and 94.7% in Affect. Reliability was also obtained for the Ideational Fluency task. Two judges, with one participating in the formal study, rated the stories with regard to the frequency of non-redundant themes per story. Interrater agreement among the two judges was 96.1%.

Though the observer and teacher were unaware of the child's formal diagnostic classification and hypotheses of the study, at times, due to the nature of the children's behavior, the teacher and observer were able to correctly identify the classificatory groupings of particular children. This was especially true for several of the children in the TMR grouping.

Predictions

The following two predictions relate to each of the respective design assumptions examined in this study.

Prediction 1

In contrast to the view that children categorized as 'handicapped' differ significantly from children classified as 'normal,' the present study predicted that despite characteristic differences between each of the four groups in the study, there would a significant degree of similarity among all of the groups in terms of their Behavior, Attention, Affect and Learning Performance.

Prediction 2

In significant contrast to Design Assumption 2, this study predicted that each of the four groups would display a significantly greater frequency of behaviors consistent with learning in the 'enriched' than in the 'reduced' stimulus setting.

CHAPTER VII

RESULTS AND DISCUSSION:

DESIGN ASSUMPTION 1

The results of the study are not consistent with Design Assumption 1; children in the 'handicapped' and 'normal' population displayed more similarities than differences in their overall learning behaviors. Though the two groups displayed characteristic differences from one another, these intergroup differences are not viewed as sufficient in degree to warrant the development of special design strategies and are seen as secondary to the primary similarities that were found among all the children in the study.

Noteworthy was that the intergroup differences that were found between each of the four groups were not consistent with the designers dichotomization of children into global 'normal' and 'handicapped' groupings. These findings are consistent with the child/environment concepts developed in this study and suggest that design considerations for the 'handicapped' can be formulated within the same design context as that of 'normal' children.

The following will discuss the results of the Behavior, Attention, Affect and Learning Performance

displayed by each of the groups during the unstructured period and the four learning tasks.

Behavior

During the unstructured period all children were rated equally in terms of Exploratory Behavior. No significant difference was found between groups on the Task-Related Scale on the following tasks (t): t1 (story), t2 (drawing), and t3 (instruction). There was a significant difference in Behavior between groups during t4 (construction) (see Table 1, p. 100). The TMR group displayed a significantly higher degree of Non-Task Related behavior than the other groups, while variability was far less among the other groups in the study.

Attention

There was no significant difference in Attentive behavior between each of the four groups during the unstructured period. Children in the HC 30, NIEH and normal groups showed little variability in Attentive behavior during t1, t2, t3 and t4. The TMR children were significantly less Attentive than the children in the other three groups during each of the four learning tasks (see Table 2, p. 101).

TABLE 1

MEAN SCORES OF CHILDREN ON TASK RELATED SCALE IN EACH SETTING DURING TASK 4 (CONSTRUCTION)

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
s1 (enriched)	1.30	1.30	2.00	1.00	1.40		
s2 (reduced)	1.00	1.00	1.90	1.00	1.23	3.47[a]	<.03
s combined	1.15	1.15	1.95	1.00		1.52[b]	NS

Note: Task-Related Scale: 1=focus is task-related; 2=focus is not task-related. Analysis was conducted on untransformed data. n=40.

[a] Between groups.

[b] Between settings.

TABLE 2

MEAN SCORES OF CHILDREN ON ATTENTIONAL SCALE IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			UNSTRUCTURED TIME				
s1 (enriched)	1.50[b]	1.40	2.00	1.60	1.63		
s2 (reduced)	1.00	1.00	1.40	1.10	2.25	1.92[a]	NS
s combined	1.25	1.20	1.70	1.35		26.32[b]	<.001
			TASK 1				
s1 (enriched)	1.00	1.20	1.90	1.10	1.30		
s2 (reduced)	1.00	1.00	1.90	1.00	1.23	9.74[a]	<.001
s combined	1.00	1.10	1.90	1.05		2.02[b]	NS
			TASK 2				
s1 (enriched)	1.00	1.10	2.00	1.00	1.28		
s2 (reduced)	1.00	1.00	1.70	1.10	1.20	10.84[a]	<.001
s combined	1.00	1.05	1.85	1.05		1.83[b]	NS
			TASK 3				
s1 (enriched)	1.10	1.00	2.00	1.00	1.28		
s2 (reduced)	1.00	1.00	1.80	1.00	1.20	15.63[a]	<.001
s combined	1.05	1.00	1.90	1.00		.43[b]	NS
			TASK 4				
s1 (enriched)	1.00	1.10	2.00	1.00	1.28		
s2 (reduced)	1.00	1.00	1.70	1.10	1.20	10.84[a]	<.00
s combined	1.00	1.05	1.85	1.05		1.83[b]	NS

Note: Attentional Scale: 1=attentive; 2=mixed attentiveness; 3=inattentive. Analysis was performed on untransformed data.

aBetween groups. bBetween settings.

Affect

Children in each of the four groups displayed Enjoyment with equal frequency during the unstructured period and t1, t2, t3 and t4.

All groups were equally rated as Calm during the unstructured period as well as during t2, t3 and t4. A significant difference was found in the frequency of Calm behavior displayed during t1, with the NIEH group evidencing the lowest frequency of this affect (see Table 3). There was a significant difference in the frequency of Calm displayed in t1 (Table 3, p. 103). Children in the HC 30 and normal groups displayed a greater frequency of this affect than the NIEH and TMR (Table 3).

In terms of Restless behavior, there were no significant differences between each of the groups during the unstructured period as well as in t1, t2, and t3. A significant difference in Restlessness was found during t4. As displayed in Table 3, the normal and NIEH groups displayed the lowest frequency of Restless behavior during this task while the HC 30 and more particularly, the TMR group, evidenced a greater frequency of Restless behavior.

The children in each of the groups evidenced no significant difference in Apathetic behavior during the unstructured period t2 and t4. A significant difference between groups was found during t1 and t3 (see Table 3). During each of these tasks, the NIEH displayed the greatest frequency of Apathetic behavior.

TABLE 3

MEAN NUMBER OF AFFECTS DISPLAYED BY CHILDREN IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			CALMNESS TASK 1[a]				
s1 (enriched)	8.10	3.10	4.70	6.80	5.68		
s2 (reduced)	10.10	7.20	4.50	9.70	7.88	4.05[c]	<.01
s combined	9.10	5.15	4.60	8.25		11.26[d]	<.00
			RESTLESSNESS TASK 4[b]				
s1 (enriched)	1.80	.30	4.60	0.0	1.68		
s2 (reduced)	.30	0.0	3.30	0.0	.90	3.02[c]	<.04
s combined	1.05	.15	3.95	0.0		1.66[d]	NS
			APATHY TASK 1[a*]				
s1 (enriched)	0.0	4.00	0.0	2.30	1.58		
s2 (reduced)	0.0	1.70	0.0	1.20	.73	7.73[c]	<.00
s combined	0.0	2.85	0.0	1.75		8.88[d]	<.01
			APATHY TASK 3[b]				
s1 (enriched)	2.30	8.10	0.0	2.50	3.23		
s2 (reduced)	1.50	5.50	0.0	2.50	2.38	3.93[c]	<.02
s combined	1.90	6.80	0.0	2.50		1.73[d]	NS

Note: Means represent a frequency count, n=40.

[a] Scores were transformed for the analysis with an arcsin transform.

[b] Scores were transformed for the analysis with a square root transform.

[c] Between groups.

[d] Between settings.

*Apathy had a group X setting interaction effect F=3.27, p .02.

Learning Performance

Cognitive Learning. In terms of Ideational Fluency a significant difference between groups was found. The children in the normal group scored highest in this task whereas the TMR group scored the lowest with the NIEH and HC 30 ranking respectively between these two groups (see Table 4, p. 105). With regard to Diversity of Themes the HC 30 and normal children performed similarly to one another and significantly higher than the NIEH and TMR groups who scored equally on this task (see Table 4).

Behavioral Learning. There were significant differences between groups found in the number of Trials to Learn in t4. Children within the normal and NIEH groups required a similar number of trials to complete t4 while the children within the HC 30 and in particular, the TMR group, required the greatest number of trials to complete this task (see Table 4).

These findings suggest the need to reexamine the prevailing design perspective which dichotomizes 'normal' and 'handicapped' children in terms of their design needs. The degree of similarity of the 'normal' and 'handicapped' children on many of the behavioral measures suggests that these populations need not necessarily be conceptualized as two separate groups but rather as a single population of children with varied learning abilities.

These results are consistent with the concepts developed in this study and discussed in detail in Chapter

TABLE 4

MEANS OF LEARNING TASKS GIVEN TO CHILDREN IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			IDEATIONAL FLUENCY[ac*]				
s1 (enriched)	6.90	4.80	2.90	11.20	6.45		
s2 (reduced)	10.30	14.00	5.70	14.20	11.05	6.24[e]	<.00
s combined	8.60	9.40	4.30	12.70		34.33[f]	<.00
			DIVERSITY OF THEMES[bd]				
s1 (enriched)	1.30	.70	.70	1.50	1.03		
s2 (reduced)	1.50	1.10	1.10	1.50	1.30	3.02[e]	<.04
s combined	1.40	.90	.90	1.50		3.41[f]	NS(.07)
			TRIALS TO LEARN[c] TASK 4				
s1 (enriched)	21.30	16.00	46.60	18.70	25.65		
s2 (reduced)	21.40	15.60	37.70	15.10	22.45	46.32[e]	<.00
s combined	21.35	15.80	42.15	16.90		7.52[f]	<.01

Note: n=40.

[a] Ideational Fluency represents a frequency count of the number of non-redundant ideas narrated within each story.

[b] Each story/drawing received one of the following ratings: 1=no story/drawing; 2=unique theme; 3=theme not unique.

[c] Scores were transformed for the analysis with a square root transform.

[d] Analysis was conducted on untransformed data.

[e] Between groups.

[f] Between settings.

*Ideational Fluency had a group X setting interaction effect F=3.84, p .02.

IV. This view emphasizes the basic similarity of all children in the way they learn, regardless of psychiatric categorization. Though the children displayed differences from one another in cognitive and emotional functioning, all the children did share fundamental similarities in the way they behaved and learned as reflected in their Behavior, Attention, Affect and Learning Performance.

Of all groups observed, the TMR children evidenced the most differences from the other groups in the study. Significantly, the children from this group were as dissimilar to the other groups within the 'handicapped' grouping as they were to children in the 'normal' population. These results indicate the heterogeneity of the 'handicapped' population and reflects the inadequacy of a perspective which globally dichotomizes children in terms of 'handicapped' and 'normal.'

The results reflect the heterogeneity of the 'handicapped' and the need of not grouping these children together arbitrarily under an excessively global classification of 'handicapped' because they share psychiatric/educational labels. The dichotomization of children into 'normal' and 'handicapped' groupings reflects little of the understanding that currently exists in the psychological literature regarding the basic similarities and distinguishing characteristics of these children.

The results of the study support the psychoeducational literature regarding the basic similarities and

differences between these children. All the groups in the study shared similarities in their general interest to explore and learn, yet they displayed differences in the way they approached each task.

Children Classified as Mentally Retarded

Children within the TMR categorization displayed cognitive limitations related to concept formation, focal attention, memory and receptive and expressive communication. These children displayed difficulties in learning that were significantly different from the behaviors of the other groups during the Behavioral and Cognitive tasks during the four learning tasks. In terms of Behavioral learning, their difficulties were most evident on t4 which involved constructing a tree/ladder. This task, which taped a variety of cognitive skills, such as concept formation and sequential memory, reflected a typical learning situation that involves sequential instruction - a task very similar to the ones that are conducted each day in school to teach the basic academic skills. On this task the children performed with significantly less skill than any of the other groups observed; requiring the most trials to complete the learning task and displaying the greatest degree of inattention and restlessness. Children within this grouping also displayed a significantly greater inability to focally attend during the 'story,' 'drawing' and 'instructional' tasks reflecting the degree to which

their attentional difficulties hampers their intellectual development.

The children's performance on the Cognitive Learning tasks similarly reflected limited cognitive abilities that distinguished these children significantly from the other groups in the study. The children's performance on the 'story' and the 'drawing' reflected severe difficulty in verbal and motoric expression as well as in imaginative, divergent thought. For example, when asked to make-up a story, one child, who was typical of the group, had difficulty expressing himself in a coherent, goal-directed manner. He stated: "airplane goes brrrr - it stopped the water - a big shark - he ate the helicopter - he took a stick - he got killed." During the Story Task, the children in this group narrated significantly fewer ideas per story (Ideational Fluency) than any of the other groups in the study. On the Drawings, many of the children were unable to produce anythind beyond advanced scribbling.

Their performance on the Incidental Learning task similarly found children in this group to be performing well below any of the other groups in this study. Their inability to recall materials from each setting reflects the limited attentional, conceptual and memory functions of these children and the extent to which children in this category differ from children within other groups within the 'handicapped' as much as they differ with other 'normal' children.

Children Classified as NIEH

Whereas children within the TMR group evidenced behaviors that reflected cognitive limitations, the children within the NIEH grouping, who are considered as intellectually capable as children within the 'normal' population, evidenced differences from the other groups in their affective interest during the Cognitive and Behavioral Learning tasks. Children in this group were rated Apathetic significantly more often than children in any of the other groups during the story and instructional tasks. Interestingly however, despite their observed apathetic disinterest in the tasks, the children performed similarly to the 'normal' and learning disabled children in Ideational Fluency and Trials to Learn.

Noteworthy was that the two tasks in which these children displayed the most disinterest were 'passive' auditory-verbal tasks that did not involve 'active' perceptual-motor functioning. The story task demanded mental imagery and verbal expressiveness, while the instructional task required passive processing of auditory and visual sequential information. In contrast, the children within this grouping were rated as calmly involved as the children within the normal and HC 30 groupings during tasks that required active motor involvement. These findings suggest that the preferred learning modality for these children would be in perceptual-motor instruction.

Children Classified as Learning Disabled

The performance of the children in this group differed significantly from the behavior of children in the TMR and NIEH groups but did not behaviorally differ from the children in the normal grouping on any of the tasks in the study. HC 30 children were rated equally to normal children with regard to their Attentional Behavior and Learning Performance.

Due to the subtlety of their perceptual difficulties children within this grouping have historically been an enigma -- from a diagnostic as well as a learning point of view. Though the children performed statistically alike the normal children, they ranked consistently behind the normal and at times, below the NIEH in Attentional Behavior and Learning Performance. These findings reflect the subtlety of their learning problems and supports the view that children within this group display significantly different types of learning difficulties than children in the TMR and NIEH populations.

Overall, the findings suggest that children within the 'handicapped' population should not be viewed within the prevailing, medically based design perspective. The similarity in the way the children within each of the groups took interest and actively explored and learned, clearly demonstrated the fundamental way that children learn and reflects the inadequacy of the designers global

dichotomization of children into 'normal' and 'handicapped' groupings.

The findings are consistent with the assumptions underlying the concepts developed in this study. These concepts are rooted in the notion that all children, regardless of psychiatric/educational handicaps are intrinsically interested and motivated to interact with the environment and places its emphasis on the basic similarity of all children in the way they learn. In this regard, the results of the study support the view that despite differences found between the groups, 'handicapped' and 'normal' children share fundamental similarities in the way they learn.

Whereas dichotomizing children in terms of their psychiatric/educational handicaps may be helpful in developing psychotherapeutic intervention strategies and in formulating individualized instructional programs, there is little empirical or theoretical justification that this dichotomization translates into the need for specially designed learning settings for the 'handicapped.'

Results and Discussion: Design Assumption 2

The results of the study do not support Design Assumption 2 but rather indicate that children in the 'handicapped' population can benefit from the same environmental qualities as those formulated for the 'normal' child.

These findings do not support the view that children within the 'handicapped' population require a separate, specially 'reduced' stimulus setting from the 'enriched' varied, complex stimulus setting that has been formulated as optimal for learning for the 'normal' child.

Whereas much of the design literature emphasizes the need for a separate setting characterized by 'reduction' in the stimulus properties of the setting from that designed for the 'normal' child, the results of the study indicate that such a practice may ultimately hinder rather than promote learning for 'handicapped' children. Although the design literature addresses itself to the potentiality for highly distractable, restless and even hyperactive behaviors to be fostered by a varied, complex setting formulated along lines developed for the 'normal' child, the results of the study indicate that such behaviors were evidenced with greater frequency in the 'reduced' than in the 'enriched stimulus setting for all children. In significant contrast to Design Assumption 2, the 'handicapped' children exhibited a significantly greater frequency of calm, attentive, explorative learning behaviors as well as better learning performance in the 'enriched' than in the 'reduced' stimulus setting.

Behavior

During the unstructured period, children in each of the groups had a significantly greater frequency of

Exploratory Behavior in the 'enriched' than in the 'reduced' setting. Conversely, the children were rated Non-Exploratory with a significantly greater frequency in the 'reduced' than in the 'enriched' setting (see Table, 5, p. 114). During t1, t2, t3 and t4, no significant differences were found in terms of Task-Relatedness between the two settings.

Attention

There was a significantly greater frequency of Attentive behaviors in the 'enriched' than in the 'reduced setting during the unstructured period (see Table 2, p. 101). The children evidenced as much Attentive Behavior during t1, t2, t3 and t4 in the 'reduced' as they did in the 'enriched' setting.

Affect

The children displayed a significantly greater frequency of Enjoyment in the 'enriched' than in the 'reduced' setting during the unstructured period (see Table 6, p. 116-117). No significant differences were found between the two settings with regard to this affect during t1, t2, t3 and t4.

Children in each of the four groups displayed a significantly greater frequency of Calm behavior in the 'enriched' than in the 'reduced' setting during the

TABLE 5

MEAN NUMBER OF BEHAVIORS DISPLAYED BY CHILDREN IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			EXPLORATION U TIME				
s1 (enriched)	8.50	8.20	5.00	8.20	7.48		
s2 (reduced)	13.20	11.50	10.00	10.60	11.33	2.00[a]	NS
s combined	10.85	9.85	5.00	9.40		6.50[b]	<.02
			NON-EXPLORATION				
s1 (enriched)	3.40	1.50	2.80	4.10	2.95		
s2 (reduced)	.10	0.0	2.10	0.0	.55	1.00[a]	NS
s combined	1.75	.75	2.45	2.50		14.19[b]	<.00
			NON-ADAPTIVE BEHAVIOR U TIME				
s1 (enriched)	1.60	2.00	2.90	.50	1.75		
s2 (reduced)	0.0	0.0	.30	0.0	.08	2.09[a]	NS
s combined	.80	1.00	1.60	.25		21.68[b]	<.00

Note: Means represent a frequency count. Scores were transformed with a square root transform. n=40.

[a] Between groups.

[b] Between settings.

unstructured period and t1, t2, t3 and t4 (see Table 6).

During the unstructured period, children were rated as Restless with a significantly greater frequency in the 'reduced' than in the 'enriched' setting (see Table 6). During t1, t2, t3 and t4 the children were rated Restless as often in the 'enriched' as in the 'reduced' setting.

There was a significantly greater frequency of Apathy displayed in the 'reduced' than in the 'enriched' setting during the unstructured period and t1 (see (Table 6). During t1 there was a significant group x setting interaction effect. The HC 30 and TMR groups displayed no Apathy in either setting while the normal and most dramatically, the NIEH group evidenced the most significant decrease in Apathetic behavior in the 'enriched' setting. No differences in Apathy were found between the two settings during t2, t3 and t4.

Learning Performance

Cognitive Learning. In terms of Ideational Fluency the children expressed a significantly greater number of thoughts per story in the 'enriched' than in the 'reduced' setting (see Table 4, p. 105). A significant setting x group interaction was found. Although Ideational Fluency was greater for all groups in the 'enriched' setting, the setting had a particularly strong effect on increasing the Ideational Fluency of the NIEH group.

With regard to Diversity of Themes no significant

TABLE 6

MEAN NUMBER OF AFFECTS DISPLAYED BY CHILDREN IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			ENJOY - U TIME[a]				
s1 (enriched)	0.0	0.0	0.0	0.0	0.0		
s2 (reduced)	0.0	.90	1.20	.60	.68	.75[c]	NS
s combined	0.0	.45	.60	.30		5.32[d]	<.03
			CALM U TIME[a]				
s1 (enriched)	10.00	7.30	9.90	7.70	8.73		
s2 (reduced)	14.20	14.10	13.00	14.40	13.93	.43[c]	NS
s combined	12.10	10.70	11.45	11.05		24.92[d]	<.00
			CALM TASK 1[b]				
s1 (enriched)	8.10	3.10	4.70	6.80	5.68		
s2 (reduced)	10.10	7.20	4.50	9.70	7.88	4.05[c]	<.01
s combined	9.10	5.15	4.60	8.25		11.26[d]	<.00
			CALM TASK 2[b]				
s1 (enriched)	9.60	5.80	4.40	7.60	6.85		
s2 (reduced)	11.50	8.20	4.90	8.60	8.30	2.07[c]	NS
s combined	10.55	7.00	4.65	8.10		3.97[d]	<.05
			CALM TASK 3[a]				
s1 (enriched)	10.10	6.00	10.00	11.20	9.32		
s2 (reduced)	12.40	9.10	11.10	11.90	11.12	1.17[c]	NS
s combined	11.25	7.55	10.55	11.55		6.5[d]	<.01

TABLE 6 (continued)

MEAN NUMBER OF AFFECTS DISPLAYED BY CHILDREN IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
			CALMNESS TASK 4[a]				
s1 (enriched)	11.90	10.40	10.20	8.80	10.32		
s2 (reduced)	15.20	11.70	14.10	10.20	12.80	.36[c]	NS
s combined	13.55	11.05	12.15	9.5	11.56	7.93[d]	<.01
			RESTLESSNESS U TIME[a]				
s1 (enriched)	2.60	5.50	5.10	4.20	4.35		
s2 (reduced)	0.0	0.0	.80	0.0	.20	.92[c]	NS
s combined	1.30	2.75	2.95	2.10		32.47[d]	<.00
			APATHY U TIME [a]				
s1 (enriched)	2.40	2.20	0.0	3.10	1.93		
s2 (reduced)	.80	0.0	0.0	0.0	.20	1.03[c]	NS
s combined	1.60	1.10	0.0	1.55		9.13[d]	<.00
			APATHY TASK 1[b*]				
s1 (enriched)	0.0	4.00	0.0	2.30	1.58		
s2 (reduced)	0.0	1.70	0.0	1.20	.73	7.73[c]	<.00
s combined	0.0	2.85	0.0	1.75		8.88[d]	<.01

Note: Means represent a frequency count.

[a] Scores were transformed for the analysis with a square root transform.

[b] Scores were transformed for the analysis with an arcsin transform.

[c] Between groups.

[d] Between settings.

*Apathy Task 1 had a group X setting interaction effect. $F=3.27$, p .02.

differences were found between the settings with regards to t1 and t2. The results do indicate a positive trend however (p=.07) in terms of greater Diversity of Themes in the 'enriched' than in the 'reduced' setting.

Behavioral Learning. The results indicate that a significantly greater number of Trials to Learn were needed in the 'reduced' than in the 'enriched' setting to successfully complete t4 (see Table 4, p. 105).

Incidental Learning. A significantly greater number of items were Recalled in the 'enriched' than in the 'reduced' setting (see Table 7, p. 119).

Discussion

The findings of the study do not support the set of assumptions that underlie the prevailing design perspective for the 'handicapped.' The results suggest that those design considerations that have been viewed as beneficial for the 'normal' child are equally beneficial for children categorized as 'handicapped.' These findings suggest that the design perspective which advocates altering or modifying the physical setting to compensate for the child's perceived 'handicap' may ultimately interfere with rather than promote learning.

These results suggest the importance of redirecting the current conceptualization of the designers from its prevailing unidirectional focus on stimulus impact, to a

TABLE 7

MEAN NUMBER OF UNIQUE MATERIALS RECALLED IN EACH SETTING

	GROUPS						
Settings	HC 30	NIEH	TMR	N	G comb	F	P
s1 (enriched)	2.70	2.00	.20	3.70	2.15		
s2 (reduced)	7.20	10.00	1.80	12.60	7.90	18.05	<.00
s combined	4.95	6.00	1.00	8.15		42.37	<.00

Note: The child's recall of materials was converted to a number representing a proportion of the total nunmber of objects unique to each setting. Scores were transformed for the analysis with an arcsin transform. n=40.

perspective which emphasizes the interactive relationship between the child and their environment. The findings indicate that varied, complex, responsive stimulation that is arranged in a balanced, coherent manner, facilitated interaction and promoted behaviors that were basic to learning for all children. Significantly, the findings indicate that a setting designed in a manner that was consistent with the set of assumptions developed by the designers, facilitated rather than reduced 'non-adaptive' behaviors as well as hindered learning.

Behavior

In terms of the child's Behavior during the unstructured period, the findings suggest that the significant degree of Exploratory Behavior evidenced in the 'enriched' setting illustrates the capacity of the environment to facilitate learning by promoting interactions between the child and their environment. By offering the child varied opportunities to have an 'effect' upon their settings, the 'enriched' environment invited the child to interact and satisfied their need to involve themselves with their surroundings. In that children learn through exploration, the 'enriched' setting proved to be a highly effective learning setting for all children, regardless of psychiatric/educational 'handicap.'

In significant contrast to the behaviors evidenced in the 'enriched' setting, the children were often observed in

Non-Exploratory behaviors in the 'reduced' setting. These findings are consistent with the view that children are inherently drawn into interacting with settings that provide interest to the child and that the 'reduced' setting, which offered the child significantly fewer opportunities to interact, did not promote exploration.

Moreover, the frequency of Task-Related behaviors evidenced during the four learning tasks clearly do not support the design assumption that the extraneous stimulation found in the 'enriched' setting would interfere with the 'handicapped' child's ability to behave in a manner that was consistent with the learning tasks. The children were not drawn from the required tasks by the surrounding stimulation as the designers had assumed, but rather displayed behaviors that were consistent with the learning tasks during each of the four tasks in each of the settings.

Significantly, in contrast to what the designers had postulated, a few of the children evidenced a greater frequency of Non-Adaptive behaviors, often viewed as symptomatic of a psychiatric disorder, in the 'reduced' than in the 'enriched' setting. For example, a few of the children, all of whom were categorized as TMR, displayed a variety of odd, idiosyncratic behaviors in the 'reduced' setting. These children were often described in the log notes as highly distractable, overactive and very restless and appeared very difficult to manage without supervision.

These children were often observed shifting their interest several times between each observation. This behavior was not characteristic for the majority of children in the study.

This highly distractable behavior was consistent with the types of behaviors for which reduced environmental stimulation had initially been formulated by Strauss and Lehtinen (1947). Noteworthy however, was that of the 30 'handicapped' children in the study, only about 10% of the children fit into this highly distractable group -- the group for which many of the special design considerations for the 'handicapped' have been based.

In dramatic contrast to their highly distractable, restless behaviors in the 'reduced' setting, however, these same children displayed relatively calm, attentive behaviors in the 'enriched' setting. Whereas in the 'reduced' setting they displayed an inability to focally attend, in the 'enriched' setting they oftentimes displayed an active, attentive interest and curiosity. These issues are illustrated in the following sequential behavioral record of a child categorized as TMR in each of the stimulus settings during the unstructured, free play period:

Reduced Setting	Enriched Setting
1. looks at train	1. looks at fish
2. talks to self	2. plays with model building
3. makes odd noises	3. plays with optic lens
4. presses nose to poster	4. plays with slinky
5. looks at train poster	5. plays with drums
6. touches train poster	6. plays with cymbals
7. talks to self	7. plays with cymbals
8. presses nose to poster	8. plays with cymbals
9. presses chest to poster	9. plays with cymbals
10. talks to self	10. plays with cymbals
11. presses hand on table	11. plays with cymbals
12. looks at poster	12. plays with cymbals
13. tries to climb ladder in poster	13. plays with viewer
14. walks	14. plays with viewer
15. looks at poster	15. plays with viewer

The results suggest that idiosyncratic behavior may not be a total reflection of a problem that resides within the child but rather that these behaviors are, in part, reflective of the interactive influences of the character of the child and the qualities of the setting.

Besides odd, idiosyncratic behaviors, a few of the children evidenced non-adaptive behaviors that could be regarded as 'regressive' in character in that they were indicative of earlier modes of adaptation and coping, such as 'thumbsucking' and 'talking to self.' For example, the following record is of a child categorized as NIEH in each setting during the unstructured play period.

Reduced	Enriched
1. listens to teacher	1. looks at fish
2. looks at number chart	2. plays with model of body
3. looks at number chart	3. plays with dinosaur
4. looks at number chart	4. plays with slinky
5. looks out window	5. plays with slinky
6. looks out window	6. plays with slinky
7. sits	7. plays with slinky
8. sits	8. plays with electricity
9. sits with thumb in mouth	9. plays with electricity
10. sits with thumb in mouth	10. plays with viewer
11. sits with thumb in mouth	11. plays with viewer
12. sits with thumb in mouth	12. plays with viewer
13. sits with thumb in mouth	13. plays with viewer
14. lays head on teacher's desk	14. plays with viewer
15. lays head on teacher's desk	15. looks at mobile

The character of the child's behavior in the 'enriched' setting was of calmly attentive, active exploration while the child's behavior in the 'reduced' setting was characterized by behaviors that could be viewed as regressive. These findings suggest that 'reduced' stimulus qualities may have promoted some discomfort and that the

child may have sought relief in self stimulation in light of the low stimulation in the 'reduced' setting.

In terms of the concepts developed in this study, these idiosyncratic and regressive behaviors reflected non-adaptive coping strategies that the children utilized in order to manage with their disinterest and lack of opportunity to interact with their settings in the 'reduced' environment. In that the 'reduced' setting did not offer the child sufficient interest, the child may have turned inward for stimulation or resorted to earlier, more adaptive coping strategies of a younger child, to deal with the understimulation in the 'reduced' setting. These findings suggests that certain psychiatric symptoms may be rooted in the character of the child/environment relationship rather than a reflection of an attribute that resides within the child.

The results suggest that design strategies which focus on compensating for the child's 'handicap' are unsound and that design considerations should be redirected towards an appreciation of the vital role of the environment in promoting interest and interaction. In that motivation is basic to all learning, a setting which stimulates a child's interest to interact, will clearly promote more behaviors consistent with learning for all children. These findings suggest that despite psychiatric/educational disabilities, the levels of stimulation that are viewed as optimally beneficial for the 'normal' child are equally beneficial to

'handicapped' children.

Attention

In terms of the Attention dimension, the greater frequency of attentiveness that was displayed in the 'enriched' setting during unstructured time is similarly viewed as a result of the interest that was promoted by the varied stimulation. The findings indicate that a setting designed to stimulate interest and interaction promotes attentiveness and that there was a greater degree of Inattentive behavior in the 'reduced' setting in that there was not a sufficient degree of such stimulation.

These findings are in dramatic contrast to basic assumptions underlying many of the special design considerations formulated for the 'handicapped.' Rather than developing special design strategies which aim to reduce distractability by compensating for the child's 'handicap,' the findings indicate that an 'enriched' setting, as those developed for the 'normal' child, promoted attention for all children, regardless of a child's perceived 'handicap.'

In terms of the concepts developed in this study, the child's attentional problems should not be viewed as an attribute of the child but rather as reflective of the relationship between the child's cognitive-perceptual functioning and the capacity of the setting to promote and support interest and interaction. The findings indicate

that a setting which satisfies such a match promotes attention, whereas a setting which does not support such interests, promotes inattention and distractability.

Affect

The significant degree of Calm evident in the 'enriched' setting suggests the capacity of the setting to nourish and gratify the children's basic learning needs, while the Restless and Apathetic affects evidenced in the 'reduced' setting may have reflected dissatisfaction with the environment in meeting such basic needs and interests. Significantly, the results indicate that Calmness was associated with Attentive, Explorative behaviors in the 'enriched' setting while Restlessness and Apathy were associated with Non-Explorative and Non-Adaptive behaviors in the 'reduced' setting.

It was noteworthy that during t1, there was a significant group x setting interaction, wherein the NIEH children displayed a marked decrease in their Apathetic behavior in the 'enriched' setting. This result suggests that apathetic disinterest may not necessarily reflect an attribute of an emotionally impaired child as the medical/pathological perspective suggests, but rather may be a function of a non-adaptive match between the child's needs and the capacity of the setting to nurture and satisfy them.

The results of the study strongly suggest that the

focus of the special design considerations for the 'handicapped' have been misdirected. Whereas the designers have assumed that a 'reduced' stimulus setting would promote more calm in that the setting would be cognitively manageable, the findings indicate that for all children, regardless of psychiatric categorization, the interactive child/environment fit may be the critical design issue involved in formulating settings that promote well-being and satisfaction of one's learning needs.

Learning Performance: Cognitive Learning

The significant findings found on Ideational Fluency in the 'enriched' setting illustrates the degree to which creative mental imagery and self expression were promoted by the varied 'enriched' stimulus setting. Whereas the designers had postulated that 'handicapped' children may experience cognitive confusion and disorientation that would impair learning in such a varied, complex setting, the results of the study indicate that practically all of the children in the study, except for the TMR group, evidenced an ability to effectively utilize the varied stimulus properties of the 'enriched' setting to promote imaginative thought.

The varied, creative character of the stories expressed on task 1 in the 'enriched' setting were in sharp contrast with the relatively brief, simple and unimaginative stories expressed in the 'reduced' setting. The

following stories illustrate some of the responses of the children on this task. For example, a child categorized as HC 30, gave the following story in the 'reduced' setting:

> I said I like you. See the movie named the Pink Panther? I eat popcorn, do you like popcorn? I have a watch at home, do you like watches?

In the 'enriched' setting the same child, while examining the skeletal models of the human being and animal, gave the following story:

> This is my skeleton. This is his brain, this is his feet. Your feet is big. A dinosaur is made out of bones. They walk, they eat, they rest, they play around. They go to a pond and drink water. That's me! This is a built man, they are bones, they are connected to the joints. He got ribs, he's got no meat, he don't get no shoes.

Whereas this child's story in the 'reduced' setting was conceptually concrete, simple in content and thematically somewhat fragmented, the child's story in the 'enriched' setting was far more abstract, and coherently complex in subject matter. Significantly, the child's imaginative thought was stimulated by materials in the 'enriched' setting.

Another child, classified as NIEH was unable to spontaneously make up a story in the 'reduced' setting. While in the 'enriched' setting this same child spontaneously related the following story:

> I'd like to be an astronaut. I'd like to go to the moon. I'd like to fly in a rocket ship. The moon would be black and have sand and rocks. It may get lighter. I'd like to be a sea captain. It would be fun because I like water. I'd go anywhere.

This child's performance on the 'story' task was not

atypical. Several of the children had difficulty spontaneously making up a story while in the 'reduced' setting. These findings clearly suggest that the 'enriched' setting promoted spontaneous, imaginative mental imagery.

In terms of the significant group x setting findings that were found in Ideational Fluency, the results indicate that the settings had an especially influential impact on the children's performance within the NIEH group. Children in this group displayed a significantly greater degree of Ideational Fluency in the 'enriched' than in the 'reduced' setting.

Within the 'enriched' setting the NIEH group evidenced a far sharper rise in Ideational Fluency than did the other groups. In the 'reduced' setting, they ranked 3rd of the four groups, scoring only slightly below the normal group of children. This dramatic shift in performance which is underscored by the decrease in Apathetic behavior suggests the stimulating impact that the 'enriched' setting had on learning for children within this group.

In exploring this result, it is interesting to note that historically, despite at least average intellectual capability, children within this group have had poor learning experiences and therefore often expect little success from their intellectual efforts (Silverstein & Krate, 1975). Many of these children rapidly develop attitudes of apathetic disinterest in learning situations, resulting in poor academic performance. Interestingly,

within the 'enriched' setting, this characteristic apathy was far less evident. As discussed earlier in this section, the children evidenced significantly less apathy in the 'enriched' than in the 'reduced' stimulus setting during this storytelling task. These findings suggest that the stimulus properties of the environment, may have induced these children to drop their characteristic barrier of apathy and to enter into a more open, responsive relationship with the environment. From the perspective of this study, this result underscores the important role the environment plays in the child's responsive interest or apathetic disinterest in learning. The decrease in 'apathy' and the concomitant sharp increase in Ideational Fluency within the 'enriched' setting indicates the particular importance of the character of the interactive child/environment relationship for these children.

Overall, the richly imaginative quality of the stories in the 'enriched' setting in contrast to the simple and unimaginative stories expressed by the same child in the 'reduced' setting reflects the impact of the 'enriched' setting in evoking mental imagery by drawing on the child's intrinsic interest in interacting with their environment.

Learning Performance: Behavioral Learning

The findings that children were able to complete the required learning tasks in fewer trials in the 'enriched' than in the 'reduced' stimulus setting is especially signi-

ficant in that much of the concern regarding a varied, complex setting for the 'handicapped' is the potentiality that such a setting will hinder the child's learning performance. This perspective which is based on the view that the perceptually impaired child will be unable to effectively filter out extraneous stimulation and will be distracted from attending to the teacher was not supported by the results of this study. Rather than interfering with the learning process, the results indicate that the 'enriched' setting promoted more learning than the 'reduced' stimulus setting.

These findings suggest that the overall evocative character of the 'enriched' setting promoted interest and a general openness and responsivity towards learning. In this regard, the setting generated a greater degree of responsive interest in learning the construction task than did the 'reduced' stimulus setting. These findings suggest that the benefits of the 'enriched' setting generalized beyond the unstructured, programmatic free time to the formalized, well structured teacher-student learning relationship.

Incidental Learning

The findings that the 'handicapped' children were able to recall a higher percentage of materials in the 'enriched' than in the 'reduced' setting indicates the residual benefits of an 'enriched' setting on learning.

The greater recall suggests that the setting aroused the child's interest in their general surroundings that was not directly related to the tasks presented in the study, without distracting them from attending to tasks when that was required.

In that a significant degree of learning takes place informally, often without the child's recognition, these findings indicate the secondary benefits of the 'enriched' setting. The impact of the setting on such a significant though informal type of learning is often overlooked. The findings of the study indicate that by arousing the child's fascination and explorative interests, the evocative character of the 'enriched' setting promoted a greater degree of incidental learning by stimulating the child's desire to take in their surroundings.

Whereas literature in design as well as in educational psychology discusses the difficulty that 'handicapped' children may have in effectively managing a stimulus complex setting, the results indicate that 'handicapped' children found the setting comprehensible and were able to cognitively process the 'enriched' setting in a way that promoted learning.

Significantly, in terms of the children's Behavior, Attention, Affect and Learning Performance, the results of the study suggest that the prevailing model of psychiatric classification does not adequately incorporate the impactful role of the physical setting on the child's

behavior. As indicated in the study, children in each of the 'handicapped' groups consistently evidenced dramatic qualitative differences in their behaviors in each of the two stimulus settings -- whereas in the 'reduced' setting the children often evidenced behaviors consistent with psychiatric symptomatology, while in the 'enriched' setting, these same children behaved similarly to the 'normal' population.

There is a significant amount of psychiatric literature that examines the complex and controversial issues regarding psychiatric diagnosis. Whereas an in-depth examination of these issues is beyond the scope of this study, in terms of the issues explored, the results indicate that the character of the setting is a significant factor in promoting 'psychiatric' behavior.

Many of the behaviors evidenced in the 'reduced' setting were consistent with symptomatology associated with particular types of psychiatric disorders. For example, several of the children who evidenced restlessness and distractability while in the 'reduced' setting were calmly attentive in the 'enriched' stimulus setting. In terms of possible diagnostic classification, while in the 'reduced' setting these children behaved in a manner that was consistent with the diagnostic classification of 'attention deficit disorder.' Many of the children currently enrolled in special education classes are classified as 'having' such attentional 'handicaps.'

In this regard, children who evidenced an apathetic disinterest in the 'reduced' setting and who were reluctant to explore and resistant to engage with the teacher may be viewed as evidencing behaviors consistent with the formal diagnosis of 'passive-aggressive' or 'oppositional' personality disorders. The odd, peculiar behaviors that interfered with some of the children's adjustment in the 'reduced' setting and characterized as 'nonadaptive' behaviors in this study, are consistent with behaviors associated with 'brain injury,' 'childhood psychosis,' or that of a 'schizotypal' personality disorder, while the conceptually simple and thematically fragmented stories that some of the children expressed in the 'reduced' setting were consistent with the kind of academic performance of children categorized as 'trainable' and 'educable mentally retarded.'

Our findings clearly indicate the need to refine the prevailing concepts regarding psychiatric classification and for a better appreciation of the highly impactful role of the physical setting in promoting and supporting non-adaptive, 'psychiatric' behaviors.

Interviews

From an information gathering point of view, the children's responses to the interviews revealed very little data. When asked to describe each setting, practically all

of the children listed a few of the materials but were unable to provide any additional qualitative impressions. When asked how they like each setting, the overwhelming majority of the children adopted a relatively passive posture and usually responded with a shrug and look of puzzlement and responded with an undiscriminating "O.K." Efforts to probe the children further were unsuccessful. The children's performance was significant however in terms of speculating on the reasons as to why the interviews were so unrevealing in terms of qualitative data.

The inability of the children to express themselves suggest that few of the children had concepts available to them in which to assess the settings. One may speculate that the children have had few opportunities, if any, in being in a decision-making position with regard to designing their settings and that as a result, have few concepts and developed opinions available regarding the issues that were raised by the interviews. The lack of responses suggests that in terms of their opinions regarding environmental design, the children may perceive themselves in a relatively passive position, based on a long history of generally complying with the predetermined plans of their parents and teachers. In this light the children most probably have not been active participants in determining the character of their settings -- being able to effect and change them in accordance with their own likes and interests.

The responses reflect the issues in this study; that learning results from having sufficient opportunities to have an effect upon one's setting. In this regard, probing the children's opinions regarding classroom design presupposed that the children had opinions and concepts based on past decision-making opportunities to effect their settings -- a supposition that was most probably unfounded.

Overall, in light of the children's difficulty in expressing their interests and concerns in design strategies, the interviews suggest the need for children to have increased opportunities to be a part of the decision-making process in determining the character of their classroom settings. Such a process would promote a child's feeling of effectance and mastery. Perhaps as children have had more experiences in such a process, interviews, as the one conducted in this study, will be more fruitful.

Summary

Overall, the findings indicate that 'normal' and 'handicapped' children share significant similarities in their general behavior and in the way they learn. The findings indicate the need to reassess the prevailing perspectives regarding how children learn. The results clearly suggest that 'handicapped' children can effectively cope with the character and degree of stimulation that has been formulated for the 'normal' child. There was

no indication, throughout the entire study, that would support the design view that 'handicapped' children have difficulty in effectively managing with the varied, complex stimulus character of the 'enriched' setting.

Significantly, the results indicated that the 'handicapped' children had a more difficult time coping effectively in the 'reduced' setting than the 'normal' children. These findings suggest that many of the 'handicapped' children may have an even greater need than the 'normal' children for an 'enriched' setting in that the 'normal' population were at least able to cope more adaptively with the 'reduced' environmental stimulation.

In sum, these results point to the relevance of the design concepts developed in this study. These concepts and their related design implications, which focus on the interactive character of the child/environmental relationship and the role of the environment in promoting learning, can be highly relevant guiding design principles for the design of learning settings for 'handicapped' children. The results do not support the dichotomization of children in terms of their design needs but rather clearly suggests that 'handicapped' and 'normal' children can share the same set of design concepts in the formulation of their learning settings.

Implications of the Research

The findings of the study have theoretical and practical implications for children in regular and 'special' educational classes. Theoretically, the results indicate the need for further interdisciplinary integration of psychological considerations into design conceptualizations. The results of the study indicate a need to redirect the current emphasis of designers away from a unidirectional perspective which focuses on how levels of stimulation impact on chilren to an interactive conceptualization that examines the relationship between how children learn and the way in which the physical setting promotes interest and exploration as well as feelings of competence and mastery.

From a practical point of view, the findings suggest design strategies that are economically as well as administratively feasible. Materials selected for the study are readily available and relatively inexpensive. The overal cost of the 'enriched' setting was below $200 with none of the materials costing more than $10 (excluding a used typewriter costing $20).

In that teachers often perceive administrative bureaucracy as a hindrance in deciding large scale environmental classroom changes, efforts were made to formulate design strategies that were within the decision-making domain of the teacher. Whereas design alterations such as

moving walls, varying floor spaces or other large scale modifications are often economically and administratively impractical, the design of the 'enriched' setting could be adapted by a teacher with relative ease.

Noteworthy is that the design considerations developed in this study have theoretical and practical value for all children regardless of psychiatric or educational difficulties. In that many classes of 'normal' children are often designed with an emphasis on structure and definition, the results of the study indicate that children in 'regular' as well as special education classes would benefit from the design concepts formulated in this study.

Limitations Of The Study And Directions for Future Study

In that the study did not take place in an actual classroom we can only speculate as to how they generalize to an actual classroom setting. This study specifically addressed itself to the impact of an enriched, complex physical setting on the behavior of 'handicapped' children. The enriched character of an actual classroom setting however, includes more than its physical properties, it also includes its social complexity as well as its programmatic complexity. The setting's social complexity would include the impact of the child's peer interactions

on the child's behavior while programmatic complexity would reflect the varied instructional programs and scheduling to which a child is required to adjust.

The view of this study, based on the findings of this research, is that the distractability and restlessness that the designers seek to reduce by special design strategies may be more reflective of issues related to the child's difficulties in effectively coping with the social and programmatic complexities of their classroom settings than to an inability to handle the stimulus properties of the physical setting. In this regard, an empirical investigation of social and programmatic complexity would further clarify and refine our present understanding of the role of the physical setting for the 'handicapped' child.

An additional issue that is raised by the present study is the impact of an enriched, complex setting over time, wherein the benefits of novelty and familiarity on the behavior and learning performance of the children could be further explored. In that the results of the present study are based on a limited time span, the design and learning concepts developed in this study would be ideally examined over the course of the entire school year.

In light of these issues, empirical research is needed that would examine the interactive impact, over time, of 'social,' 'programmatic' and 'physical' complexity on the behavior and learning of 'handicapped' and 'normal' children.

Interestingly this research was not conducted in an ongoing classroom setting because of concern by school administrators that the environmental changes in the study would be disruptive to the highly structured programmatic format of special education classes. These administrators stressed the renowned difficulty that 'handicapped' children have in dealing with complex stimulation and change. Accordingly we may speculate that since the curriculum and programmatic structure of classes for the 'handicapped' are often determined according to concerns consistent with concepts that underlie prevailing design principles, the present curriculum and programmatic format of certain classes may do more to promote and sustain a child's problems than to aid a child in overcoming their difficulties. For example, a problem such as 'distractability' may be reflective of a maladaptive coping defense to deal with a lack of interest and behavioral options in a highly structured teaching format. Accordingly certain types of teaching methods such as a one-to-one teaching relationship or spending excessive amounts of time in an individual learning cubicle may actually promote rather than decrease distractable behavior. In this light, for certain children, problems such as distractability, which could have been a central factor in their 'handicapped' classification, may be promoted by the same programmatic structure that is intended to help them. Clearly this issue suggests an area for future study.

Significantly, in developing the design concepts in this research, the focus of the design strategies has been directed towards school settings. This focus however does not preclude applying these findings to settings for children other than those that are related to school and academic performance. In this regard the findings suggest that the concepts developed in this study may apply similarly to psychotherapeutic settings for children. There exists very little systematic research that has addressed itself to the role that the physical setting plays in individual child psychotherapy. Several authors have discussed the importance of providing the child with easy access to play materials that promote symbolic play (Axline, 1947; Erikson, 1964; Wortman, 1964) though much needs to be further understood as to the way in which the overall environmental context in which therapy takes place, promotes or hinders the therapeutic process.

As found in this study, the character of the physical setting was found to have a significant impact in promoting behaviors that were adaptive as well as those that could be categorized as 'psychiatric' in character. In that the overall environmental context was shown to have a significant influence in terms of how the child behaved, the physical setting is viewed as a significant factor in the ongoing psychotherapeutic process.

The design concepts developed in this study, with their emphasis on promoting feelings of competence and

mastery, would seem to be a highly relevant point of reference in developing a design framework in which to understand the role of the setting in psychotherapy practice. In that the overwhelming majority of children seeking psychotherapeutic services suffer from feelings of low self-esteem related to their lack of effectiveness in dealing with their surroundings, the design conceptualizations developed in this study are consistent with the goals of psychotherapy and clearly suggest directions for future study.

APPENDIX A

Materials in the 'Reduced' Setting

alphabet poster

alphabet poster (cursive)

books

calendar chart

cabinet

chairs

closet

color chart

teacher's desk

child's desk

grammar chart

map of world

markers, pencils

mobile (fractions theme)

number poster

blank drawing paper

2 plants

sports poster

6 transportation posters

scissors

tape

APPENDIX B

Materials in the 'Enriched' Setting

alphabet poster

alphabet poster (cursive)

4 astronomy posters

boat (tinkertoy construction)

books

botony posters

building model

cabinet

chairs

closet

color chart

construction blocks

corn

teacher's desk

child's desk

dinosaur models

electrical bell

fantasy poster

fish and fish tank

geodisic stick sphere

globe of world

grammar charts

human body charts

children's feelings posters

magnet

map of world

markers, pencils

mobile (fractions theme)

mobile (color theme)

motorcycle poster

musical instruments

plastic lens

drawing paper

plants

rocket (inflatable)

rocket (plastic)

rug

skeleton model

skull model

slinky

typewriter

3D Viewer

cloth wall hangings

scissors

tape

APPENDIX C

Instructions to Make the Tree

The following steps will be told to each child and visually demonstrated during the learning of the task.

1. Roll a page of newspaper lengthwise to make a tube that is about an inch and a half, just like this one.

2. When about four inches from completing the roll, put a second page in like this, and continue rolling.

3. Then bend the tube in half in this way.

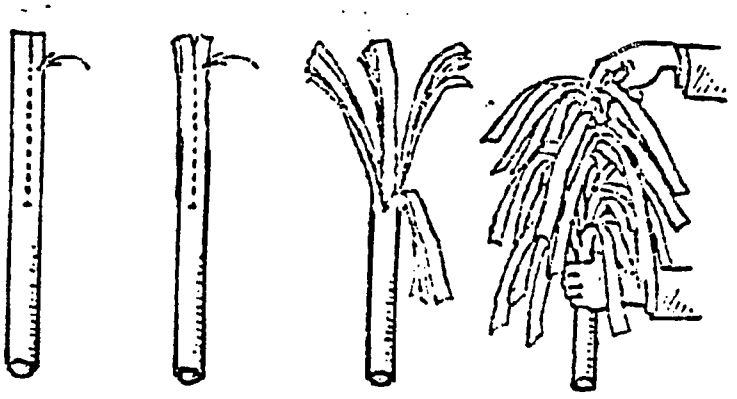
4. Flatten one of the halves like this.

5. Cut down along the center of the flattened half like this.

6. Flatten the cut pieces against each other so that the cut edges are at each side like this.

7. Cut down along the center of the pieces until you have four groups of strips that will hang down around the bottom half of the tube.

8. Hold the lower half with one hand and with a finger of the other hand in at top, carefully pull upward to start the tree growing and continue gently pulling upward.



APPENDIX D

Instructions to Make the Ladder

The following steps will be told to each child and visually demonstrated during the learning of the task.

1. Roll a page of newspaper lengthwise to make a tube that is about an inch and a half, just like this.

2. When about four inches from completing the roll, put a second page in like this, and continue rolling.

3. Flatten the tube like this.

4. About a third of the way from each end, about here, cut slightly over half way through the roll of paper and remove a piece of the tube (after the child displays knowledge as to the nature of the cut, if needed, the teacher will assist the child in the cutting of this section without penalty. This assistance will be offered in the event that some of the children may display difficulty in the level of motor skill required in the cut).

5. Make the tube ends round like this.

6. Bend the tube ends down.

7. With a finger in at the top of either of the ends like this, pull the paper up an inch or so and then pull up a bit at the other end.

8. Continue to pull up on one side and then the other side like this, until the paper will go no higher. The flat strips across the middle will be the steps of the ladder.

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