Multi-level Approach to Research in Learning

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Summary of Recommendations for Support of Research on Learning Disabilities

1. Meaningful collaboration among the disciplines.

2. Research on the social context of learning which utilizes network techniques of direct observation of social interaction in order to study problems of:
   a) social effects on infancy,
   b) familial social effects in childhood,
   c) formal and informal social contexts,
   d) interaction patterns of children with each other and with adults, and the effects of these patterns of interconnection on learning.

3. Support for multi-unit research designs as well as single-unit designs.

4. The areas in which we advocate intensive research are not neatly orthogonal to each other because investigators in the overlapping and embedded fields of development, perception, information processing, learning, etc., have not conceptualized their problem domains in the same way. Nonetheless, we feel that the following are the most promising areas:
   a) multi-modal effects on learning,
   b) the role of feedback in learning,
   c) the development of orienting, observing, and search behavior,
   d) factors directing or controlling attention
   e) development of memory and investigation of the factors which enhance it,
   f) organization and conceptualization of information, with particular emphasis on language,
   g) communication.

5. Development of specific simple and flexible assessment techniques
for establishing profiles for individual children.

6. Support for research utilizing a behavioral definition of etiology.

7. Utilization of basic and applied research in perception, learning, language, and social processes for the establishment of flexible curricula which would enable the schools to become responsive environments.
ABSTRACT

This paper has been based on the premise that learning disability, as it has been traditionally defined, is in large measure a product of our present school system. For an enormous number of children whose backgrounds are discontinuous with the cultural norms of the school, the system has actually produced intellectual problems where we believe none need exist. Only for children who have measurable sensory and perceptual difficulties has remediation been successful. But for the large majority of children labeled learning disabled, the typical techniques of remediation have failed because what is needed instead are flexible curricula and teaching procedures adaptable to the differing needs of different children.

Priorities for research resulting from such a conceptualization can be set forth on several levels, ranging from social analyses of the schools and the children they serve to assessment techniques for individual children. Within this broad range, we have focused our attention on a number of research areas. These include: studies of existing social networks and how such information can be utilized in improving learning; studies in perception and learning focused on the questions of modality influences, the role of feedback in learning, the development of orienting, observing, and search behavior, factors directing or controlling attention, and the development of memory and investigation of factors which enhance it; studies in language focused on its use in the organization and conceptualization of information and for communication; and studies geared toward the development of individual assessment procedures.

In a sense, all these research approaches would contribute toward the establishment of school as a responsive environment for the child.
In funding decisions within these priorities, we do not believe that criteria relating to the nature of research as applied or basic, or the specific use of learning disabled samples are appropriate. Instead, we would like to encourage a broad research base with the prime consideration being the quality of the proposed research.
General introduction

Underlying the approach to be presented in this position paper is the explicit assumption that learning is a basic characteristic of all living organisms, and a belief in the fact that the better able we are to understand the conditions which enable organisms with differing capacities and histories to expand their potential for learning, the better position we are in to tackle this most pressing problem today.

Given what we already know about the nature of learning and perception in the human organism, and given recognition of the varied populations the schools must serve, it is remarkable that today's educational establishment is rigid and irrelevant with respect to the varying cultures in which it operates. Rigid norms are built into this rather inflexible system, and each child is measured against these norms, regardless of his/her background and no matter what the curriculum (s)he has been exposed to. In this context, the application of the term learning disability to a child implies a deficiency in function between that child and some hypothetical normally functioning organism. The result of evaluation based on this type of comparison is the identification of the extraordinarily large number of children who fall outside the normal range as learning disabled, or any one of a number of other such terms. The demand of society that remediation be applied to this large group of learning disabled implies that somehow there is a fault in the children themselves -- as if, following a medical model, they have a disease which we must cure. The aim of the cure, of course, is to make the children perform as the norms demand.

We believe that a new model of education must be chosen, especially
at this time when education is becoming more widely available. The new model could generate a new definition of learning disability, based on a new definition of schooling. One of the goals underlying this position paper is the provision of an appropriate screening mechanism for the selection of research leading toward a more desirable kind of education. We would like to encourage those projects, both basic and applied, which have the best chance of contributing to the formation of an educational system which, unlike today's, will enhance learning ability, rather than produce learning disability.

We would like to suggest that education be defined in terms of a behavioral model which views the organism and the environment as constantly responding to each other and thereby modifying each other. Such a model offers the equal possibility of programming changes for both parts of the system, i.e., the child and the environment, depending upon the learning goals which are "deemed suitable" for any individual in any context. Education in this sense of responsive environment does not require categorizing children as belonging to a disabled class. Rather, it deals with

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2 The goals deemed suitable in education will not be the focus of this paper. We would like to note, however, that the setting of such goals is really a political process and reflects the result of the successful translation into action of the needs and desires of many groups in the society. Unfortunately, there has not been enough self-conscious examination by funding sources of what the criteria should be for setting such goals for the society at large.
each child as he or she is found, using the child's own functioning as a baseline against which to measure change. Such a system, with proper assessment techniques, should also be able to handle the children who have learning difficulties based on intrinsic impairment of their perceptual, linguistic, or general cognitive processes. This is not to say that children with neurological disabilities will not need special treatment, but only that a system which provides for individual differences can also best provide for the extremes of these differences.

As a basic goal, this relational model of education, with its important stress on appropriate education of the individual, requires that research at many levels be carried on simultaneously. A number of distinct levels suggest themselves for study: the social context of the child both at home and in school; an age specific analysis of those basic capacities of the organism which are relevant for intellectual functioning, as well as the development of techniques for assessing these capabilities for individual children; a fine-grained determination of the interaction of stimulus and response factors which produce the best processing of information in the human organism; curriculum development and its assessment based upon a funded review of the basic research literature on learning; and testing new models of schooling in real schools.

Usefulness of integrating the disciplines

Traditionally, the approach to learning disabilities has emphasized sensory and perceptual processes. Some theorists in the area, in fact, include perceptual dysfunction as a necessary component if a syndrome is to be labeled "learning disability." It is not our intention to restrict our view in this way, although it is certainly clear that sensory and
perceptual difficulties comprise a large proportion of what are typically diagnosed learning disabilities.

Despite this emphasis on perceptual functions -- surely one of the pursuits of psychology's mainstream -- the field of learning disabilities has been all too often quite separate from the mainstream of the behavioral sciences. Although learning disabilities has been said to be an interdisciplinary field, with contributions coming from a spectrum of disciplines, ranging from the biological to the social, the characterization of a multi-discipline field rather than an interdisciplinary one has been more apt.

While it is true that many researchers and clinicians from a variety of backgrounds have worked in the field of learning disabilities, they have frequently worked only from their own point of view. Thus, many studies of maturational, biological, or genetic aspects of learning disabilities have been done without evaluation of the social milieu in which the disabilities occur, the familial status of the persons (usually children) who are the subjects of the work, and the like. Similarly, social milieu or school-oriented studies have been done without regard for the physiological or psychological status of the subjects. It would seem, therefore, that an important priority for future work in this area would be the incorporation of several types of variables in a single study, or in a series of studies. In short, then, although learning disabilities have been of interest to a wide variety of disciplines, as the literature attests, there have been some striking omissions (most particularly in the area of social context of learning). Let us now not only fill in some of the gaps, but encourage truly interdisciplinary work as well.
The social context of learning

Following from the notion that schools have so institutionalized themselves that their resulting rigidity has become productive of individual learning disability, we would like to recommend instead that they become truly responsive environments. This means that they should no longer function monolithically and uniformly as if the group of children with which they deal is homogeneous. Instead they need to be made flexible and adaptable to the requirements of a diverse population, diverse not only in terms of age, developmental level, and individual capability, but also socially and culturally. Certainly a foremost priority should therefore be given to research concerned with investigating the social forms and processes directly involved in learning.

Within the social domain, we would like to suggest an alternative to the epidemiological approach, in which rates of failure in school, for example, are related to such social categories as class or ethnic group or migratory status. A more direct social orientation, with an emphasis on social networks, would include a wide range of more specific types of investigation: descriptive studies of classroom interaction; studies of adolescent peer groups in relation to school performance and in relation to speech styles; detailed quantitative interactional studies; studies of language use in relation to hypothesized familial network structure, among others. Very little in this area has developed to the point where firm conclusions can be drawn about what variables are relevant to what differences, but some important insights have been gained, and a strong expectation that work along certain lines in this area will be productive seems warranted.
We would like to give a brief sketch of the kind of relevance this area has to learning, including some reference to research findings, though with no attempt to review them here, and to consider the strategic questions on which to focus at this time, and the variables and methods they call for.

One way to conceptualize this diverse social area is in terms of three related foci and their combinations: the learner's social history, the learner's ongoing social connections outside the immediate situation, and the social connections operative in the immediate situation (e.g., a classroom). ("Social" is used throughout to refer to definable sets of connections and patterns of interaction, not merely to a categorical label.) Cross-cutting this is what we will call cultural, again not referring to labelled membership in some set, but rather to what might be considered meanings -- cues and reinforcements, modes of sequencing, interpreting, responding.

a) Social effects in infancy

It is in the child's very early social activities, that the initial system of significance -- that is, of meaning -- is acquired, on the basis of which any new exposures must first be interpreted before they can modify or be added in some fashion to that initial system. Although this is an ongoing process, its impact is probably greatest quite early. A great deal of work has been done on child-rearing attitudes; on mother-infant interaction patterns; there has been some speculation about the types of networks in which the infant and small child first learns; there have been descriptions of different cultural

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3Such a review would itself be a productive undertaking.
practices, including relative emphasis on verbal instruction, and the
degree to which the child is an observer and/or participant in various
adult activities; and particularly, there has been increasing study of
children's early acquisition of language. We have, nevertheless, at
the present time, no definitive knowledge of the critical social vari-
ables or the nature of their effects.

b) Familial social effect in childhood

At any age past infancy the child participates simultaneously
in more than one set of social connections -- e.g., a household set,
a group of neighboring children, adult and child relatives. Inter-
action patterns in each of these necessarily differ, as does the child's
position in each of them. Presumably it is here that the child must
acquire his/her first approaches to responding to cross-group conflicts
in the demands made on him/her, in the differing evaluations people
make of each other, and perhaps most importantly, in the codes of mean-
ings and values that are appropriate to each person. The role of
value conflicts and conflicts between group norms might be illuminated
by direct small-scale study of this quite unusual phenomenon. Study
of cross-group effects should take as key individuals all of those
directly relevant -- e.g., teachers, administrators, parents, as well
as children.

c) Formal and informal social contexts

With respect to the social structure of the learning situation
itself, a number of descriptive studies indicate that the prevalent
formal school structure involves the students as many single individuals
in interaction with the one teacher. This is, of course, never fully
achieved, since any ongoing set of 30 individuals will over time develop sub-groups; but where the intended formal mode opposes such sub-groups, their existence is a discipline problem rather than a learning instrument. This "many-one's" to "one" format also involves a special interactional pattern, in which, for example, the overwhelming majority of speech is in the form of output from the teacher, input (at best) to the child. The child's structured relationship to the substance he is to learn is almost exclusively, then, as decoder, only infrequently as encoder, although paradoxically he is often tested in formal situations somewhat more as an encoder. Further, very little direct attention has been paid to the effects on learning of this unbalanced interactional, or input-output, decoding-encoding structure. Small-group studies of task performance, personal satisfaction, and other variables strongly imply that this is the least desirable structure for any of the stated aims of the educational system. More rigorous studies are needed, however, not only of the classroom, but of the wide range of other situations involving explicit learning. (All human situations involve learning in some sense; by "explicit learning" we mean only to distinguish the acquisition of skills, games, information, rules, and whatever else the researcher with the informants' help is capable of differentiating at any given time, from anything else that is also being learned but that we are not yet competent to study or not interested in studying.) These situations include people's homes, street groups, work groups, and non-classroom school groups, among others.
d) The need for basic information on social interaction

Probably among the most fundamental questions on which we need information are simply: With whom does the child interact? At what ages? How much variation is there in interaction among children, with how many adults and in what settings? With how many children, of what ages in relation to the one under consideration, and with what relationship to the child, to each other, and to the adults around that child? What seems most important at this time is not a survey -- census data certainly exist on such elements as family size -- but intensive study of a fairly small number of children in order to give some deeper information on variables which cannot be picked up by a survey (although it might be possible to do so after the main variables have been discovered by more intensive procedures). Studies of small networks suggest at least three types of network structure that may be important: bounded groups, interconnected but unbounded networks, and loose unbounded networks. (In other terminology, the relationship to these of communication patterns has been discussed at length by Bernstein (1971), for example, and to some extent by Labov (1972) and others.) However, as sparse as is the information on this for adults, it is virtually non-existent for children, although it is the basis of many assumptions made about them. Yet the inference may be drawn from both small-group studies and from the still slight evidence of socio-linguistic studies that both the mode and the substance of children's learning is affected by these variables.

e) Effects of patterns of interconnection on learning

This last point need not remain wholly an inference. It can be
directly studied, initially in naturally occurring groupings, and subsequently, with the variables derived from those studies, by experimental manipulation. Family networks cannot be subjected to experimental manipulation for this purpose, but sub-groups of children in the school setting can often be. It should be noted, however, that although experimental work is essential for clarifying the relationships of variables, many issues cannot be approached this way, since both adult participation and an at least partially formal setting are unavoidable -- although observation of children's informal groups also involves an adult, the intrusion need not be as basic.

In the study of the effects of social connections on learning, two approaches to formulating the dependent variables of learning are needed:

1) Networks and formal goals of learning -- Any conscious goal of the educational system can be considered in its relationship to differences in the children's network structures. For example, reading facility can be examined in relation to home networks, peer networks (on this, see Labov, 1972), and most readily, in-school networks. In the last case, the networks can be systematically varied for size, age-span, pre-existing relationships among the children, or other variables; for the first two, differences can only be compared analytically.

2) Networks and informal learning -- In addition to the known goals, it is important to do more open-ended studies, in which one can discover something about what is in fact being learned, and in what ways, in addition to (or instead of) what may have been intended.
The school, for example, has, like any other institution, alternate systems of goals and rewards, some of them more powerful than the intended systems, and clearly some school children do learn to function very well in these systems. (One example is the distribution of monitorships, which determines who can be out of class or out of school without penalty -- see Gutwirth, 1974.) Not only in school, but in any setting, a great deal of what is being learned is not specifically intended, and can be only partially formulated in advance. For example, if we want to know more about the influence of peer groups on more formal learning -- i.e., how does what is learned in various peer groups differentially affect what is learned in school -- we can consider studying variables underlying value conflict, opposing loyalties, and antagonistic or concordant meanings. But without first studying these questions fairly open-endedly, we are very likely to miss what may be crucial factors. Nonetheless, despite the open-ended nature of such observations, variables defining the group structure, its patterns of interaction, its connections with other groups, and so on, can and should be rigorously defined. Many aspects of the effects we think may be important can also be explicitly stated in advance. But the methodology should provide ample room for exploring other unexpected effects.

Methodological concerns in the study of social networks

It is appropriate at this point to make some general remarks about methodology in this area. In the inclusion of open-ended studies as an approach to trying to discover things we may not know exist, it should be said that we will discover very little if we do not insist on rigor.
Certain network variables (like interconnectedness) that can be expected to be of general importance can be specified and defined with precision. Frequency of contact can obviously only be properly obtained through systematic observation; where certain problems require the full or partial substitution of reported frequencies, special attention must be paid to complementary studies of the amount and nature of the distortion introduced by this. Since networks are by definition connected sets, ordinary approaches to sampling are inappropriate, and must be carefully developed in the context of each of several types of studies.

Since the relevant issues require intensive information not only directly around the key individual, but also around each of those who are important to that individual, and possibly further steps out, adequate study of even a single individual could be prohibitive. Thus several coordinated approaches are called for, including branching out several steps from a key individual on some relevant criterion, direct study of a group, working out one step from each member of a group, studying a full one-step set around an individual, and so on. To some extent the choice of approach will depend on the specific problem; but it is also necessary to direct a combination of these approaches to the same problem if we are to learn how they relate to each other.

One additional methodological point should be made. Simple theoretical assumptions can generate a number of testable expectations through hypothetical manipulations subsequently tested empirically. Serious attention should be paid to coordinating the design of separate studies so as to take advantage of the efficiency and power that can be yielded in this way.
Basic research questions of importance for studies of perception, learning, and language

In pointing research toward the development of more individualized and responsive schooling, we need to know a great deal about what factors aid in learning and what factors interfere with it. Perhaps rather than learning, we should use the more general term, information processing, for learning has been traditionally confined to the area of conditioning within the context of basic research. It is only on the basis of such research that flexible enough curricula can be developed. While immediate applicability to practical situations should not be a criterion for investigation, basic research on information processing should be translated into practical approaches to curriculum development, teaching methods, and assessment techniques. In this way, schooling can become the result of a rational process.

The areas in which we advocate intensive research are not neatly orthogonal to each other because investigators in the overlapping and embedded fields of development, perception, information processing, learning, etc. have not conceptualized their problem domains in the same way. Nonetheless, we feel that the following are among the most promising areas: multi-modal effects on learning; the role of feedback in learning; the development of orienting, observing, and search behavior; factors directing or controlling attention; development of memory and investigation of the factors which enhance it; organization and conceptualization of information (with particular emphasis on language); and finally, communication.

a) Multi-modal effects on learning

Single and multiple-modality approaches to learning and
learning disabilities are examples of the next steps which could be taken in areas that have already been subject to quite extensive investigation. In recommending priorities in an area which already contains much work, greater selectivity should be exercised in funding such fields. At the same time, however, planned outcome of research can be much more specifically targeted in these better-known areas, and carefully designed studies can yield definitive information.

Specifically, it would be important to answer questions relating to input overload and underload, interactions among preferred and non-preferred modalities, and the like. For example, are there preferred modalities in individuals? Do such preferences differ between learning disabled and non-disabled persons? Are the preferences task specific, or do they cut across tasks for particular individuals? Do stimuli from two or more modalities simultaneously enhance learning, or do they result in confusion and greater disability? Are there individual thresholds for stimulus overload? Are there characteristic types of learning breakdown as a response to overload? What is the nature of interaction among modalities, and is that interaction specific to individuals or are generalizations possible about human learning in that regard?

Such research would be important for the structuring of classrooms. For example, classroom teaching is typically bi-modal: visual and auditory. If research were to show that young children, say, or disabled learners respond better to a single-mode approach to new material, implementation of that finding should be made possible. Such implementation would also have the advantage of bringing other disciplines into focus, and thus would fulfill the priority for interdisciplinary approaches.
b) The role of feedback in learning

Another type of research to be done in the sensory-perceptual area is on the role of feedback -- and the type of feedback -- in learning. For one type of study in such research, the response class to be learned could be either perceptual or motor, whereas the feedback would be by means of some perceptual mode. This could be accomplished in a discrete, single-task, single-feedback manner, or in a continuous learning situation, with criteria of acquisition.

It has been shown that non-disabled learners of varying ages will learn to discriminate nonsense figures of minimal form with no external feedback, presumably because they become able to define the salient cues in the stimulus array. How might one insure the correct separation of figure and ground in the stimulus material to be learned? What might such research tell us about the variation in threshold factors in people with learning disabilities, or in people of varying ages or backgrounds or educational attainments? How much of successful learning is dependent on the correct perception of the salient cues in a stimulus? What proportion of learning disability can be attributed to a deficiency in such perception? It has been shown that severe retardates are helped to function in discrimination tasks when the relationship between stimulus and response mode is clarified (Zeaman and House, 1963). Might it be that non-retarded learning disabled persons could be similarly helped?

Such a research approach would be closely related to the modality-oriented work described above. The question of the relationship of modality of stimulus to modality of feedback is a poten-
tially important one in the investigation of learning disabilities, especially if a lower level of functioning is found to exist in one modality and not in others. Also, it might interact with modality preference, if such exists. Is it more efficacious to present the stimuli to the preferred modality, or does more efficient learning result from the provision of feedback information in the preferred modality?

c) The development of orienting, observing, and search behavior

This area would be basically concerned with discovering the developmental sequence of the spontaneous occurrence of orienting, observing, and search behaviors, since it is upon such behavior that the very young child's sampling of his/her environment is based. Results in the literature are provocative. For example in infants (Bloom, 1974) it has been found that eye contact serves as a setting event for learning. We are beginning to assemble evidence for differences in scanning and search strategies with age and for different kinds of children. Miller (1973) hypothesized for example that since such strategies improve with age, they allow older children when viewing stimuli for long durations to overcome perceptual biases that operate at brief exposures. There may well be differences in strategies between impulsive and reflective children. Egeland (1974) for example, found that it was more profitable to teach impulsive children to use search strategies than to delay responding.

Such behavior is controlled by stimulus factors which are concerned with stimulus salience and dimensional preferences and related to the ages at which children can use various types of contex-
textual cues. Odom (1973) and others have mapped stimulus salience hierarchies for individual children and demonstrated their relationship to problem solving behavior. Medin (1973) has indicated that dimensional preference affects matching ability. A number of investigators (Brown et al., 1974; Kobasigawa, 1974; Campione et al., 1973; Baker, 1972; Klein, 1974) have found that younger children did not use available contextual cues until they were trained or instructed to. Stimulus complexity itself apparently has a differential effect on older and younger children in how much curiosity or playing time it induces (Switzky et al., 1974).

d) Factors directing or controlling attention

Another area deserves mention within this general field of sensory and perceptual functions, and that is vigilance or attention. Traditionally, vigilance is the term that has been applied to the ability to maintain a high degree of alertness in the presence of monotonous stimuli so as to detect a change or a relatively quiet signal. Attention has referred usually to an alerting mechanism and a bringing into focus of an immediate stimulus. A number of studies have shown that it enhances learning, and that certain factors can be seen to improve attention to relevant aspects of a stimulus.

Apparently, younger children may have problems in ignoring irrelevant information, particularly when it is salient (Pick et al., 1973). There is some evidence that younger children are helped by being given explicit information on what to ignore (Yussen, 1974) or when the stimuli are arranged spatially to focus attention on central stimuli (Wheeler et al., 1973). We need to know which attention focussing information
is best for which processing of different types of behaviors. For instance, Silver et al. (1973) found that non-verbal feature emphasis is better than verbal for form discrimination. Mwanalushi (1974) found that imagery was better than naming for coding and reproducing spatial patterns. Furth et al. (1973) found that labeling functioned to call attention to static arrays at all ages. Wolf et al. (1974) demonstrated that children acquire associations better by producing interactions between the associated stimuli than by observing them. Koenigsberg (1973) discovered that visual cues were better than sensorimotor cues for improving letter reversal in young children. Various types of children may use various attention focussing techniques differently. It seems (Siegel et al., 1973) that reflective children use both visual and verbal labeling better than do impulsive children.

The findings in this area are very diverse, but provocative in their possible usefulness for enhancing information processing, and thereby providing a rational base for the development of curricula.

In recent years, further subdivisions of attention have been made relating to "inwards attention" or "intellectual attention" as opposed to attention to an external stimulus. Vigilance and both attentional functions relate to learning, though perhaps in somewhat different ways. They also are apparently correlated with differential physiological responses (e.g., Lacy, 1967; Obrist, 1963; van Hover, 1974). The question of differing relationships between attentional functions and learning -- or different types of learning -- and the relationship to measurable psychophysiological changes deserves investigation as an approach to learning disabilities. This represents an area in
which considerable research has been done in differing fields, with 
little relationship or interaction between the fields. Thus, while 
neurologists and neurophysiologists have been concerned with particu-
lar brain lesions or disturbances of function that might be associated 
with learning disabilities, they have not studied the psychophysio-
logical correlates of such disturbances. On the other hand, psycho-
physiologists have studied these correlates, but with little regard 
for the learning problems of individuals. And scientists involved in 
human factors research have contributed a substantial literature on 
vigilance and its relationship to stimulus arrays, for example, with-
out much concern for individual differences or developmental factors. 
It would seem that putting some of this work together and carrying it 
forward with a focus on the learning process (information processing) 
and its disabilities would fulfill the need for greater coordination 
and amalgamation of findings from a variety of disciplines and at the 
same time contribute to the specific attentional, psychophysiological, 
and learning literature.

Another aspect of attention deserves some mention. That is, that 
some of the work in neurophysiology would seem to indicate that the 
organism must maintain a certain level of attentivity in order to 
receive stimuli (Hebb, 1958). Further, this would seem to be recipro-
cal, in that the absence of stimuli for a protracted period of time 
apparently has the effect of turning the organism off, and making it 
more difficult to apprehend new stimuli. In the field of learning dis-
abilities, this might relate to the hyperactivity syndrome. In the 
typical vigilance experimental situation, stimuli are present, but they
are of low intensity and tend to be monotonous. Does the learning
ability of the organism influence his functioning in a vigilance-type
situation? Does the stimulus mode relate to it? Does the presence of
stimuli in one, two, or three modalities influence vigilance behavior?
e) Development of memory and investigation of the factors which enhance
it

Here a number of basic questions should be dealt with. First,
how does memory change with age (Perlmutter et al., 1974)? What are
the factors that improve memory and how do they interact with age?
Flavell and his colleagues (1970) have found that younger children do
not produce a number of different appropriate mediators as well as
older children and that, in most cases, such mediators can be taught
and then utilized successfully.

There is the question of differences between the storage and re-
trieval of visual and conceptual (or verbal) information and the re-
lated question of whether younger children can better utilize visual
rather than verbal cues (Yuille et al., 1973; Kosslyn et al., 1974;
Furth et al., 1973). There are some basic theoretical questions on
short-term memory versus long-term memory having to do with whether
these are different or the same in adults and children (Peterson,
1963). And finally, how does memory differ with respect to materials
which are or are not socially related to the child. For example,
Genshaft et al. (1974) found that although both Black and White child-
ren could recall Standard English vocabulary, White children could not
recall Black English as well.
f) Organization and conceptualization of information (with particular emphasis on language)

We know that coding has a positive relationship to information processing and we assume that it is due to the organization it imposes on the material. At what ages do we have evidence that children code? Conrad (1971), Halperin (1974), Hagen et al. (1973), Salzinger et al. (1969), and Furth et al. (1973) among many others have addressed the question of whether children code at early ages, and whether labeling and verbal coding are equally effective. The evidence appears to be that labeling serves a different function and is in fact sometimes an obstruction to information processing and that the use of coding, when it occurs or is induced (Moely et al., 1974), is effective and age related.

A number of investigators have addressed themselves to the problem of the emergence and use of verbal mediators (Kendler and Kendler, 1970; Kendler, 1972; Osler, 1973; Flavell, 1970; Hagen et al., 1973; to mention a few), and the literature is not clear. We need to look at mediation using other paradigms than the shift paradigm which has dominated the field.

Language effects on information processing are intriguing and in need of a great deal of work. Let us give some examples of questions which have been raised, all of which are relevant for our understanding of what messages both the structure and the semantics of language convey to young children. Brown (1968), Ervin-Tripp (1970) and Blank (1974) have examined the development of the way children understand various types of wh-questions -- certainly a tool which we use un-
thinkingly in all teaching of children. Nelson et al. (1973) have successfully produced more category type questions in children when they were useful in acquiring information the children needed for information processing. Huttenlocher et al. (1968) have shown large differences in information processing depending on whether the structure of a verbal instruction and the stimulus field were congruent for a child. Wetstone et al. (1973) examined receptive language for very young children and believe that when children are still nonfluent themselves, semantic constraints alone rather than syntactic constraints as well determine the messages a child receives. MacNamara (1972) has raised the question of whether one can separate syntactic and semantic constraints in trying to understand children's language acquisition. (Perhaps one should never teach grammar alone!) Clark (1970) has suggested that we look at the development of relational concepts because they are useful tools in the acquisition of further language. And finally, Schultz (1974) has begun some important work on children's appreciation of humor which indicates that modes of understanding vary with age.

g) Communication

If we are seriously to advocate an informal classroom, then we must understand more about how successful children are in conveying information and understanding the information that is relayed to them. Glucksberg, Krauss, and Weisberg's work (1966) is very relevant, and among other interesting findings, they have noted that children are more successful in communicating information which is labeled from their own verbal repertoire.
Very recently Garvey et al. published a study (1973) describing communicative speech in a nursery school. In one laboratory, Salzinger, using a somewhat similar design, the variables that make for communicative versus egocentric speech among 3 year olds in a nursery school classroom, have been examined.

Methodological considerations for basic research designs in the areas of perception, learning, and language

In keeping with the heavy emphasis on perceptual dysfunctions in this field, there has been a great deal of research directed toward the sensory and perceptual processes thought to underlie learning and its disabilities. Therefore, in charting priorities for future research in these areas, it is necessary to be somewhat more selective than in those areas which have been less traditionally associated with this field. That is, when entering a previously cultivated vineyard, one must look over the remaining grapes most carefully; the same degree of selectivity is not required for the vineyard in which one is picking for the first time.

The primary investigative areas in perception and learning disabilities have been visual perception, visual-motor functions, and, to a somewhat lesser degree, laterality and left-right discrimination. In the last decade or so, auditory perceptual studies have come into more prominence. For the most part, these studies have been applied to or have been done in the context of disabilities in reading and general language skills, though there have been a few broader, normative approaches in the area (e.g., Belmont and Birch, 1963, 1965). The typical disability-oriented study in this field has involved the relating of particular perceptual, perceptual-motor, or laterality measures to a particular disability. Often other
measures are also taken, and both the perceptual problem and the specific learning disability are related to such variables as social class background, age, birth order, academic subjects, or the like.

If more studies were to be done in this area, it would seem in keeping with the establishment of priorities that they be addressed to more unique problems, or that they proceed either down the level of complexity in a search for single-unit relationships, or toward the advanced complexity of multi-unit, multi-factorial studies.

1) Single unit designs --

An example of a single-unit type of investigation would be to evaluate the relative importance of a single perceptual, motor, or perceptual-motor factor in the acquisition of a given skill. A study of this type should probably be replicated with various groups, such as individuals who had learning disabilities and those who did not, or with different social samples. The goal would be to determine the influence of single versus interactive variables on a criterion task. The experimental procedure might involve a cross-sectional design, using a substantial number of subjects, or it could be done with fewer subjects and a longitudinal-type design. As an example of a cross-sectional design, a particular task could be selected as the criterion, and then experimental groups constituted in terms of the skill to be measured. For one group, a "pure" perceptual skill could be measured; for the second group, a pure (or as pure as possible) motor skill would be evaluated; for a third group, a perceptual-motor skill would be involved; a fourth group could serve as a control, if the specific design demanded. That would be a paradigmatic cross-sectional design. A longitudinal approach to the same problem might
involve the constitution of two experimental groups and one control group. For one experimental group, a pure perceptual skill would be evaluated in relationship to the criterion task; for the second experimental group, a pure motor skill would be evaluated. Then the first group would have a motor component added to the perceptual. Changes in the level of the criterion tasks would be measured and related to the nature of the given skill (i.e., perceptual, motor, or perceptual-motor).

2) Multi-unit designs --

An example of a multi-unit type of investigation would be one in which a number of perceptual modes and response modes were tested in the same subjects and then the entire matrix of results subjected to factor analysis. After factor scores had been derived, evaluation procedures would be constructed for each, the procedures would be applied to a similar but different group of subjects, and the resulting attempt at cross-validation would be evaluated. What is intended here is the subjecting of perceptual and motor variables to a Guilford-type conceptual treatment. This suggestion illustrates another desirable approach to the field of learning disabilities; the application of methods and constructs developed in other areas of behavioral science to the problem of disabilities in learning. One priority for research now might well be to relate problems and methods to the broader body of knowledge and experiment. A multi-factorial study designed on the basis of theory, and not merely as an empirical "fishing expedition," might be an ideal way to accomplish the true interdisciplinary work which was suggested as a priority above.
Methodological implications of a behavioral definition of etiology

The traditional approach to etiology is generally patterned after a "medical" or "disease" model with its associated search for a primary remote cause. Instead, we would favor a functional model of etiology in which "cause" is considered to be a complex interaction between the state of the organism and the environment. Furthermore, "cause" is useful only in so far as it is viewed not as a hypothetical construct, but rather as demonstrably and operationally related to the organism's current (functioning) behavior.

In keeping with a behaviorally oriented analysis, an etiological approach would specify the definition of a particular mode or level of perceptual functioning, and the relating of this mode to a particular mode or rate of learning a task or a skill. This differs from the classical clinical approach to etiology, which involves searching the behavior and skill of a subject until a deficit is discovered, and then relating performance on the learning task to the deficit. In the clinical approach, if no deficit is discovered, no individually relevant information is gleaned. In the behavioral approach, what would be sought, defined, and analyzed would be the relationship between particular perceptual modes of function and particular learning modes, and therefore the individual's learning processes can be better understood, whether or not he exhibits a problem. A priority for research might be, therefore, a fine-grained analysis of perceptual-learning relationships, including a search for what have been referred to as "mediating variables" — e.g., variables which exist between the specifics of the perceptual skill and the specifics of
the learning skill. An example might best illustrate what is meant.

There is a well-known relationship between socioeconomic status (SES) and reading level, such that children from low SES backgrounds are at greater risk for developing reading disabilities. Once such a correlation is obtained and verified, very little more can be said. However, if one seeks out the mediating variables, a new research program can be mapped. SES is a global concept, as is reading skill. If one breaks down SES into, say, perceptual experiential background, and then also divides reading skill by type of errors made, one might find, for example, that children from noisy slum environments have greater difficulty in auditory discrimination, and that those same children make the kinds of mistakes in reading that could be attributed to faulty auditory discrimination of words. Auditory discrimination of words thus becomes a mediating variable between SES and reading skill. If one then further analyzes the low-SES slum environment, it might be found that the ambience is a noisy one, and one in which there is not a great deal of speech directed to the children. So it might be that ambient noise and practice in listening are additional mediating variables. These specific -- or more specific -- variables might then be evaluated in terms of their relationship to the specifics of reading skill.

In terms of the view of etiology expressed above, the teasing out of this relationship would in fact be the analysis of the etiology of the reading disability in question.

Suggested methodology for assessment of children's level of functioning based on a behavioral model of disability

A continuing problem, dealt with under a variety of rubrics in the
past, is that of identifying individual skill levels and patterns of perceptual and perceptual-motor performance. We should like to broaden this concept from older concerns with "early identification" of learning disabilities, or simply classifying achievement levels: what is needed is a method of assessing individual perceptual skills easily and effectively so that learning curricula can be adjusted to suit individual levels and needs. If, as indicated previously, schools can become truly responsive environments with individualized curricula, then perceptual skill patterns would be important information on which to base the design of a child's school program. It would seem that a combination of such a profile, together with information about a child's progress in various curriculum elements, would be a superior approach to the current one which emphasizes standard group intelligence and achievement tests.

The approach being suggested would, in evaluating problems in learning, make secondary any attempt to define and attach to individuals diagnostic labels relating to disabilities. Instead, each child's profile would include information as to his developmental level, and curricula would be individualized both in terms of pattern and level. Such an approach would also be consistent with the current emphasis on "mainstreaming" (i.e., placing children in need of special education in classes with their non-disabled age peers for varying amounts of the school day): if each child in a given area were following an individualized curriculum based on his own pattern and level, then the child whose performance was at what might be termed a disability level would simply be working on his own curriculum. Only the most severely disabled learners would be placed in separate special education classes.
While it is recognized that devising a system of perceptual assessments which could be easily and quickly administered and which would yield the needed information, is not a quick or a simple task, it seems eminently worthwhile to encourage its inception. Some instruments and experimental work already exist which could be effective starting points for the work (e.g., Graham-Kendall Designs, Frostig programs, some reading readiness-type tasks, etc.); a careful combing of the clinical and the experimental literature would undoubtedly yield more. The first step, then, might be a thorough evaluation and charting of past work, resolution of inconsistencies in findings, and development of paradigms which could be tested. Successful application of such an approach would also have the ultimate advantage of preventing those learning disabilities which issue from a poor match between a child's intrinsic perceptual patterns and the demands of the curriculum.

Summary and Conclusions

This paper has been based on the premise that learning disability, as it has been traditionally defined, is in large measure a product of our present school system. Furthermore, we feel that the idea of "disability" per se, coupled with an outmoded and rigid school system, has prevented children who have been classified as being outside the normal range from receiving the kind of education they could best profit from. Only for children who have measurable sensory and perceptual difficulties has remediation been generally successful, whereas for a large majority of children it has failed because it is an ad hoc and ex post facto procedure applied to a situation where rigidity has not allowed for the development
of flexible curricula and teaching procedures suitable for working routinely
with the differing needs of different children. For an enormous number of
children whose backgrounds are discontinuous with the cultural norms of the
school, the system has actually produced intellectual problems where we
believe none need exist.

We are therefore advocating support for research that will provide
appropriate materials and more sophisticated understanding to enable us to
move toward a new concept of school which is no longer in keeping with the
current structure in which a single teacher is expected to teach a single
curriculum to a group of children. We would like to see all children who
are not grossly physically and mentally handicapped schooled together in
groups with fairly large age ranges. In order to avoid the detrimental
procedure which has been known as "tracking," we would like to see "classes"
organized like learning labs in various areas such as mathematical concepts,
language arts, etc., which are set up with curricula adequate for use with
a number of years' age-span and suitable for use with diverse cultural groups.
In such a situation teachers would serve the function of assessing child-
ren's level of ability and achievement, organizing and choosing children's
programs, monitoring their progress, and most importantly, stimulating and
motivating children as they choose to work in the various areas. Formal
classes with a single teacher would be set up only on an ad hoc basis when
needed or requested.

Such a conceptualization forces upon us the necessity of providing multi-
faceted curricula which need not be taught in their entirety by a teacher
but which are programmed so as to allow the children to move along on their
own. Such curricula must be rationally based upon basic research on the
factors which enhance learning in the areas of perception, feedback, observation and search behavior, attention, memory, organization of stimuli through various kinds of mediators and codes, and language development both as a self-regulatory behavior and a communicative behavior. Although some of these areas are well researched, others are not and demand that we be more selective in funding. Nonetheless there are many gaps which need filling -- and we could well use a review of the findings pointed toward their use in the development of curricula.

In addition we need to gain an understanding of the effect of various types of social interaction patterns on learning, since working in such "labs" would give rise to varied types of formal and informal group structures. If we understood the communicative and reinforcing properties of such groups, we could utilize them in the establishment of classroom procedures which would enhance learning rather than deter it.

In keeping with the idea of school as a responsive environment, we need new approaches to assessment. We are advocating the development of profile-type assessments to be routinely used for all children, particularly in the areas of perception, language skills, and description of social variables, so as to estimate their strengths and to place them appropriately into types of curricula.

Intellectual achievement would be gauged on the basis of the mastery of particular curricula. Achievement of curricula, therefore, would be tantamount to moving on to a subsequent level of difficulty and would eliminate the need for grading. Only for special purposes, such as entrance to new schools, would reference to national norms be needed -- and indeed these need not be based on testing but preferably upon a profile
of the curricula that a child has mastered.

With respect to network studies, we might mention a further application of network studies to problems of educational improvement. Although many of us talk about the areas of ignorance, in which we are badly in need of good research to know what affects learning, it is also true that there are many aspects of the learning process that are well studied, and which are nevertheless rarely successfully incorporated into an educational system. There can be little question that one pervasive obstacle to genuine alteration of the schools has to do with the complex of pressures mediated through a system of connections involving teachers, administrators, unions, legislators, and community. Direct study of this system of connections, and of possible changes in it, could play a critical role in the attempt to introduce any other kind of changes.

In looking toward an alteration of basic school procedures, we would also like to see, as future priorities, some real-school-applications of basic research, where new procedures and curricula based upon a behavioral model of schooling are applied and evaluated.

Furthermore, we do not believe that a scale concerned with evaluating the research as being applied or basic should be considered as a proper criterion for support, or whether the population studied is a "learning disabled" population. As long as the research can be shown to have relevance for modification, particularly for the expansion, of the capacities of the organism for learning -- for acquiring the desired learned behaviors -- that should be sufficient. One final stipulation should be mentioned. In an effort to avoid a bandwagon effect in favor of covering a broad research base, we feel it important to realize that investigators conceptualize their fields very differently and that a number of approaches should
be encouraged -- so long as the variables with which they deal are explicitly and operationally concerned with learning. There is a lot that we need to understand and there is no way of knowing, at this point, whether the pay-offs will come from cognitive versus behavioral research; from RNA studies or imagery studies of memory; from study of the effect of the organisms' own responses versus the effects of other people's response on learning capacity; from animal versus baby research.

That kind of criterion should be avoided in favor of establishing criteria of excellence for the research designed. We believe that research in all areas discussed must be encouraged and supported, because of the complex nature of the problem.
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