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ABSTRACT

Presented is an introduction to taxonomic instruction, which is defined as a method of classifying substances and strategies of teacher instruction for handicapped children. In the second of three reports, the teacher is described as having four main roles: facilitation of healthy interaction processes, evocation of productive thinking processes, manipulation of reinforcement systems, and transaction of basic skills and competencies. Instruction as part of a communications system among teacher and pupils is illustrated. Target population of the present project is said to be underachieving boys with severe discipline problems, aged 10 to 15 years. The taxonomy is shown to limit its concern to the pupil's engagement in absorbing adaptive basic skills and concepts. Skills are broken into subskills and then translated into instructional materials and non-material instructional stimuli. The taxonomy is shown to permit diagnostic teaching with stated goals of individualization and personalization. Basic skills in the field of reading are: cognitive-perceptual, language analysis, comprehension, and study skills. Structure and function of the taxonomic model are explained, followed by applications, of which the main one is said to be a tool for lesson planning. (See also EC 040 216 and EC 040 218.) (CB)

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An Introduction to Taxonomic Instruction

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Research and Demonstration Center
for the Education of Handicapped Children
Teachers College, Columbia University
New York, New York

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By Abraham J. Tannenbaum,
Project Director

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The Taxonomy of Instructional Treatments is a constantly evolving concept which is by now the product of many people. To all of them, too many to list by name, I offer my sincerest gratitude for the ideas they have contributed and for their patience in observing me hatch my own.

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Abraham J. Tannenbaum
June, 1970

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AN INTRODUCTION TO TAXONOMIC INSTRUCTION

Abraham J. Tannenbaum
Director, Taxonomic Instruction Project

In the past decade, there has been a shift away from molar questions regarding the characterization of good teaching toward the more molecular emphasis on ways to systematize the analysis of teacher behavior. This does not imply a diminution of interest in teacher effectiveness. If anything, the concern is probably more intense than ever. What has changed, however, is the *method* of inquiry which is currently operating on the principle that the clue to teaching *success* is in the organization of teaching *process*. Unless there is a logical way of describing how the teacher functions as an actor and interactor in the classroom, it is merely academic to speculate about requisite teacher competencies for attaining educational goals. Nor is it possible to ascertain what kinds of learners are most responsive to various instructional tactics without some conceptual understanding of these tactics. There is need, therefore, to focus more directly on teacher process variables and how they facilitate learning both independently and in interaction with the learner's inner and outer world. At least one behavioral scientist (Birch, 1968) goes so far as to "concede that differences in learning achievements, whether measured by intelligence tests or by school achievement in human beings, represent the products of different degrees of goodness of fit between the learner, the task, and, *in particular, the instructional mode* [italics added]."

The relatively new quest for a science of teaching may eventually make educators less dependent upon learning psychology as a favorite source of guidance for classroom practices. Although no clear relationship between laws of learning and teaching has yet been explicated, they are apparently often seen as fairly faithful mirror images of each other. It is not uncommon, for example, for teacher trainers to proclaim as a truism the notion that "knowing the child" is sufficiently suggestive of how (and even what) to teach him. Bruner (1966) dismisses such assertions as euphorically naive and suggests four major features of a theory of instruction: it should search out the experiences that predispose the individual toward learning; it should organize knowledge for easy assimilation by the learner; it should develop logical sequences of learning content; and it should design ways of modulating the pace of instruction and the reward-punishment system for maximizing learning. In a somewhat different vein, Gage (1964) argues that theories of learning or behavior could also encompass teaching, but only if teaching were regarded as a dependent variable. However, teaching theorists consider the behaviors of teachers as independent variables and place their emphasis on analyzing, forecasting, and controlling the ways in which teaching influences pupil development.

Regardless of how we fit teaching processes into the general constellation of behavioral theory and research, it is apparent that the classroom practitioner benefits less from the work of the educational psychologist than is often suspected, for several reasons:

1. Nobody has yet succeeded (or perhaps tried hard enough) to conceptualize a teaching paradigm that derives exclusively from laboratory-type learning research. Too often, such research tends to pull away from global concerns in favor of manageable minutiae, and these particles are rarely put together to form a meaningful, applicable body of knowledge for the teacher. To the curriculum-bound teacher, faced with the

day-to-day problems of "covering" subject matter, "controlling" behavior, and "nurturing" ideas, Nevitt Sanford's criticism of psychology as being "fragmented, over-specialized, method centered and dull" may well apply to scientists who are assumed to be discovering desirable classroom methods through their miniature-style research on problems that seem remote from the life of the classroom.

2. If principles of teaching are supposed to be based on what is known about learning, the mere incompleteness of learning theory and research can be a rationalization for saying nothing definitive about instructional processes. Perhaps what teachers and learning psychologists need is a middle-man who is able to interpret to both groups their mutual concerns and relevancies. It is more likely that even if a common language were somehow devised, there would be surprisingly little substance for the groups to communicate to each other. The study of under-the-skin variables that pertain to learning is an incredibly complicated and elusive process, and there is no telling how many lifetimes of research are needed to produce enough results to lead from chaos to order. Existing objective data on the teaching-learning process are at least to some extent inconclusive, insufficient or incomprehensible, so scientists are reluctant to go far out on a limb and make too many bold assertions. They often tend to exercise restraint upon the educational practitioner who is forced by the realities of his role to make judgments that are not yet supportable by existing evidence. These cautionary influences have the salutary effect of protecting the practitioner against fanciful subjectivism. But he can also misinterpret the need for caution and immobilize himself into a state of noncommittal know-nothingism.

3. Learning psychology does not define the parameters of the teacher's role. There is a wide spectrum of variables influencing learning success, some of which fall within the purview of other helping services. Psychoanalytically oriented scientists (Pearson, 1954; Kessler, 1966), for example, characterize learning inhibition in terms of neurotic solutions of childhood conflicts which require psychotherapy, not teaching, at least as part of the treatment. There is also a growing literature on human chemistry as an affector of learning (Krech, 1967; Mueller, Kasl, Brooks, and Cobb, 1970) and this also involves factors that teachers are ill-equipped to control. The teacher's role must therefore be defined independently of what we know about knowledge acquisition. It has to take into account such matters as the *unique* objectives of the teaching-learning process, the *unique* setting in which it takes place, the *unique* mechanisms which the teacher employs in doing his job, and the *unique* responsibilities, rights, and expectations the teacher enjoys in relation to his pupils (as distinct from those of the social worker, psychotherapist, guidance counselor, and correction officer in relation to their clients).

4. Even if learning psychology were far more advanced than it is today in contributing to the teaching process and in helping define the teacher's role, there would still be a vital need for an independent study of teaching for reasons that are best expressed through Gage's (1963) simple analogy:

> Farmers need to know something about how plants grow, and how they depend on soil, water, and sunlight. So teachers need to know how children learn, and how they depend on motivation, readiness, and reinforcement. But farmers also need to know how to farm — how to till the soil, put in the seed, get rid of weeds and insects, harvest the crop, and get it to market. If our analogy applies even loosely, teachers similarly need to know how to teach — how to motivate the pupils, assess their readiness, act on the assessment, present the subject, maintain discipline, and shape a cognitive structure.

Special education has long been concerned with the definition of instructional processes. A recent statement by Blackman (1970) typifies that concern rather vividly:

> In building a teaching system, the instructional specialist in special education must decide, in specific and measurable terms, the behaviors that he would like to teach. The system that he develops for teaching them must be qualified by the parameters imposed by the various types of deficit encountered in handicapped children. He must have an analytical understanding of the abilities, disabilities, and general learning styles of the particular group of handicapped children for whom the instructional analysis is being planned. He must have information concerning the psychological prerequisites underlying the acquisition of particular school tasks. He must have sufficient flexibility to permit modifications in the instructional sequence when the learners' behaviors or teachers' objectives so dictate.

The entire literature in special education is sprinkled with instructional schemes to fit the learning profiles of handicapped children. They include models of prescriptive teaching (Peter, 1965), clinical teaching (Smith, 1968), the engineered classroom (Hewett, 1968), psycholinguistic teaching (Bush and Giles, 1969), and directive teaching (Stephens, 1970), among others. In a sense, whatever is special in special education should be reflected in the practices, styles, tactics, and strategies of teaching. Similarly, whatever constitutes teaching as against other helping services should reveal itself in the way the professional behaves in working with a client. There is, of course, greater variance in learner profiles than in instructional treatments, just as there are more types of physical illness than there are types of medical prescription for them. Perhaps that is as it should be, since in both instances a single remedy may be appropriate for more than one ailment. There is no point in proliferating treatments for their own sake; what counts instead is matching treatment to diagnosis. Ideally, special education is indistinguishable from general education in recognizing the *need* for such a match. The two professional fields diverge, however, when account is taken of the *nature* of the match that is indicated for a "deviant" as against a "normal" population.

In the special education tradition of formulating systems of teaching processes, the present writer and his associates have developed a Taxonomy of Instructional Treatments for behaviorally disordered, educationally retarded children. It is an attempt to classify systematically the whole gamut of instructional substances and strategies within a particular content area for this handicapped population. It takes into account the teacher's function in (a) organizing instructional content logically and sequentially through some modified epistemological analysis; (b) transmitting instructional stimuli through any of the learner's receptive sensory modalities; (c) eliciting responsiveness through any of the learner's expressive channels of communication; and (d) mastering the total range of instructional modes (or styles) and methods (or pupil grouping arrangements) that are possible in the classroom. It is hypothesized that every learning task has its own logical, sequential properties which have to be adapted to fit the unique cognitive style and capacity of the learner. Also, the instructional process encompasses a large, but far from infinite array of teacher behaviors, and each learner responds best to a particular sub-set of these behaviors. The Taxonomy catalogues the "what" and "how" of instruction, thus clarifying for the teacher the behavioral choices available to him when he plans and executes instruction. Knowledge of these behaviors is a first step toward learning how to perform them and, ultimately, how to select appropriate ones to fit each pupil.

Before elaborating on the structure and applications of the Taxonomy, it is appropriate to clarify some key matters concerning the teaching process and to describe the target population for which the Taxonomy has been initially designed. This discussion will form a necessary context in which the Taxonomy should be viewed.

THE TEACHING PROCESS

In his detailed analysis of paradigms for research on teaching, Gage (1963) claims there are two kinds of theories of teaching, one which attempts to explain why the teacher behaves as he does in a teaching-learning situation, and one which seeks to describe how the teacher acts to modify the learner's behavior. The Taxonomy belongs with the latter type. It deals exclusively with the teacher's arsenal of materials and strategies that define his role as an instructor. And since teaching behaviors do not necessarily eventuate in learning, it is the task of the teacher to determine which of his armaments accomplishes the task best. It implies facility in the use of all items in the arsenal's inventory and the ability to determine which is most appropriate for a child at a given time, under given circumstances, and for given goals.

Some Dimensions of the Teaching Process.

Teaching can be defined in terms of several task clusters that overlap with each other as well as with other helping services. At least four such clusters lend themselves to clear definition, and one of them — instruction — is the Taxonomy's primary concern. The four teaching roles are as follows:

1. *Facilitation of healthy interaction processes.* Education at school is intended to be a socializing experience in which affect is no less vital a mechanism for growth than cognition. Teachers should plan activities to help increase the child's depth and range of self-understanding, his potentiality for satisfying and productive human relationships, his sensitivity to the world around him, and his need to balance recognition of authority with maintenance of individuality. Much of the early work of Anderson and associates (1946), which dealt with "dominative" and "integrative" contacts in the classroom, confined itself mainly to the socializing aspects of classroom life. Domination was defined as forceful behavior between two individuals, in which one imposes his will upon the other during a social episode or "contact," without regard for his rights. Contacts intended to produce socially integrative behavior are marked by interpersonal flexibility and adaptation that, in turn, reflect mutual respect for human differences. Some of the results of Anderson's study showed that the teacher's own leanings toward dominative or integrative contacts determined how pupils behaved in these respects. Also, in classrooms where a teacher tended to be more integrative, pupils demonstrated more spontaneity and initiative, and volunteered more social contributions to problem solving. On the other hand, where the teacher was more dominative, there was greater pupil polarization around complying to teacher domination and rejecting it completely. Flanders' (1960) subsequent studies follow the sam tradition, concentrating on differences between direct (or authority centered) vs. indirect (or supportive) influences. Besides showing the effect of indirect teacher style on the promotion of positive pupil attitudes toward school, Flanders also showed that they influencec pupil learning. In observing 15 seventh grade social studies teachers and 16 eighth grade mathematics teachers, who taught an aggregate of 744 pupils, he discovered that (1) indirect teacher influence increases learning when a student's perception of a goal is confused and ambiguous, and (2) direct teacher influence increases learning when a student's perceived goal is clear and acceptable. Still another example of systematic attempts to shape affective and social behavior in groups is the work of Redl and Wineman (1952) with behaviorally disordered children. Although this study was done in a residential setting rather than a classroom, and full assessment could never be accomplished because the work had to be discontinued prematurely, it has important implications for teachers. The staff developed a series of ego-supportive controls intended to make the acting-out children more self-sustaining in group life. These tactics included "planned ignoring," "signal interference," "hyp dermic affection," "hurdle help," "physical restraint," "authoritative verbot," and "tensio

decontamination," among others, all of which could become part of a teacher's stock-in-trade.

2. *Evocation of productive thinking processes.* In too many classrooms, there is little breadth or imagination in the teacher's efforts to build problem solving facility in pupils. Much time is spent on formulating glib answers to trivial questions, requiring the pupil to serve as a poor substitute for a data bank, antiseptically avoiding critical issues, emphasizing the useful rather than the enriching qualities of knowledge, motivating achievement through threat of examination, and designing examinations as little more than surveys of the pupil's memory bank. Some teacher observation scales and teaching models promise to open up possibilities for adding new dimensions to intellectual activity in the classroom. A fair amount of this work seems to have been inspired by Guilford's research on the structure of intellect (1956). For example, Gallagher and Aschner (1965) have developed an elaborate system for analyzing teacher-pupil interaction in the classroom with special focus on several factors in the Guilford model: cognitive memory and convergent, evaluative, and divergent thinking. Such an observation scale makes it possible to monitor the extent to which the intellective processes are emphasized in the classroom and to note their effects on educational accomplishment. A more recent publication by Meeker (1969) further elaborates the applicability of the Guilford model to the classroom, and suggests specific curricular designs to nurture certain cognitive operations. These include memory, evaluation, convergent production, and divergent production of figural, symbolic, and semantic content, along with cognition of figural, symbolic, semantic, and behavioral material. A more focused attempt at actualizing Guilford's divergent production operation was Suchman's (1960) inquiry training program, a kind of teacher-guided learning by discovery. There are, of course, ways other than Guilford's to classify intellective processes in the classroom. Smith (1960), for example, has studied teacher behavior extensively and identified twelve logical operations involved in it. They include defining, describing, designating, stating, reporting, comparing and contrasting, substituting, classifying, opining, evaluating, conditional inferring, and explaining. Presumably these operations are modeled by teachers with the expectation that pupils will learn to perform them.

3. *Manipulation of reinforcement systems.* There is no doubt that teachers have to learn how to utilize rewards and punishments as means of shaping behavior. Sometimes the privilege of meting out rewards and punishments is abused not only as a means of intimidation but also as a prop for a poorly structured lesson. Nevertheless, when employed skillfully and judiciously, it can become an important ingredient in the teacher's repertoire, especially in work with handicapped populations. There is already a growing literature on behavior modification in educational programs for the emotionally disturbed. Hewett (1968) acknowledges the power of the technique but cautions that it be couched in clearly defined educational goals. In his own work with a four-and-one-half year old non-verbal autistic child (Hewett, 1965), he reports success in modifying highly disruptive and self-destructive behavior through judicious reinforcement of desirable responses and extinction of undesirable ones. Other educators (Whelan and Haring, 1966; Clarizio and Yelon, 1967) have reported extensively on the use of operant conditioning in the education of emotionally disturbed children. In fact, one might say this is the current rage in teacher training programs and applied research in that area of handicap.

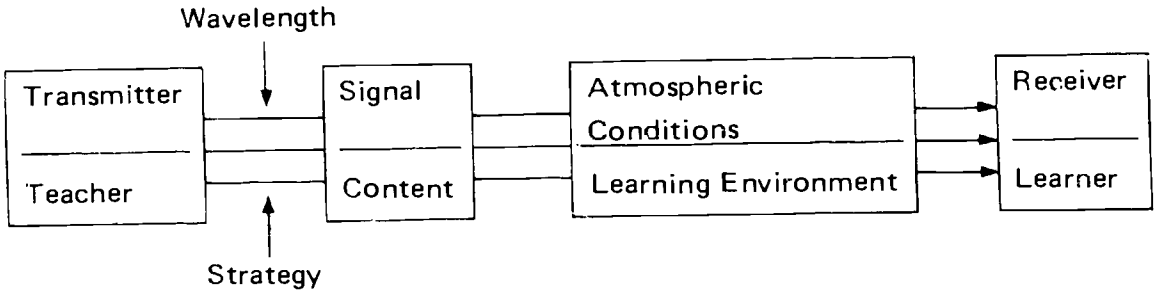
4. *Transaction of basic skills and competencies (i.e. instruction).* These are the so-called bread and butter experiences in the classroom that receive major emphasis in work with handicapped children. They usually include language and number facts — the tools of learning at the simplest levels. The Taxonomy restricts itself to this domain, although no brief is held for it as being more important than the others. The content area selected is beginning reading for a population of pre-adolescents, most of whom have failed to get beyond the primary grade level in at least four years of elementary schooling, and many of whom function at no better than the readiness level. This choice of content is arbitrary, albeit vital in the total educational program. However, the Taxonomy could be applied to other skills, provided the operations are instructional.

Instruction as Part of a Communications System.

The instructional act is basically one of communication in which teacher and pupils function as producers, senders, and recipients of messages. A partial representation of this communications system is provided in Figure 1:

Figure 1

Communication in the Instructional Process



This is admittedly an inadequate representation of the instructional process, principally because it omits the feedback loops. The teacher is not *just* a transmitter — he is a receiver too; and the learner is not *just* a receiver — he is also a transmitter. Besides, whoever is acting as the transmitter formulates his signal on the basis of his evaluation of the nature of content to be transmitted, the atmospheric conditions (or learning environment) in which the message will be sent, and the "wiring system" of the receiver (learner) at the time communication is to be established. Thus, there is a complex interconnectedness among the four elements of the model. However, for clarity's sake, it is suggested that the teacher be viewed as the transmitter who sends his message through atmospheric conditions to link up with the receiver. His task is to locate those strategies (wavelengths) which will give the learner (receiver) the clearest reception.

Of all the links in the communications chain, the receiver (learner) has enjoyed the lion's share of attention among theoreticians and researchers. There is already much information available concerning the learner's perceptual-cognitive skills, his integrative processes, his information retrieval system, his divergent, convergent, and transformational styles, and his affective-motivational powers that mediate learning behavior. But much of what is written about him is subject to debate, and what is generally accepted is still only a small fraction of what has yet to be discovered. One of the major unknowns in this wiring system and its capabilities has to do with the extent of its modifiability. Are we dealing with fixed capacities that habituate the channelization of signals that do not overload the system? Or is the network in a constant state of change, parts of it atrophying through disuse while other parts increase their capacity and build new linkages through the stimulation of powerful signals? Although most behavioral scientists seem to espouse the latter principle, their methodology in measuring human functioning often leads them into the trap of Zeno's paradox. That is, they capture the flight of intellect at a given point in time and describe its position in space, high or low in comparison to other intellects, but not its velocity or directionality. The impression gained is that it is fixed, motionless, and incapable of accelerating or changing course. Hence,

the usual assessment is aptly called a measure of the *status* of human functioning, implying that it is only a temporal view of the subject under changing maturational and stimulus conditions. When these modifiers are known and their impact measured, then it is possible to predict a person's functioning status from one point in time to another. But predictability is often confused with immutability, and therein lies the rub. It creates a false, fatalistic impression that nothing can be done to alter the way a person is destined to perform as prophesied by the status measure and that the environment could well remain relatively unmodified in order to help make the prophesy self-fulfilling.

The Taxonomy operates on the hypothesis that the receiver's wiring system can be altered in structure and power by the way messages are transmitted to it. Each receiver presumably operates best at its own preferred wavelength, and so does the transmitter. This raises the possibility, even likelihood, of a mismatch between the two. An example of such a mismatch in a teaching-learning situation would be a classroom in which the teacher prefers working with the total group in a question-answer technique of imparting basic skills, while Johnny sitting in the third row is terrorized or turned off by such an approach and would much prefer working alone in a self-pacing, self-checking arrangement with programmed instruction material. The obvious task for the teacher, therefore, is to make a proper alignment, which involves expanding his own range of strategies and determining which of them arouse the greatest receptivity in each pupil. The notion here is that preferred channels of reception can be strengthened by means of judicious exploitation. Furthermore it is argued that communicating on the child's strongest wavelengths has ego-supportive value, and sets the stage for operating on new wavelengths for more flexible receptivity. This is especially applicable to those children whose self-images have been lowered during long periods of school failure.

Successful transmission depends not only on the choice of the appropriate wavelengths; it also requires proper articulation of the message. In instructional communication, the message consists of substantive material organized logically in terms of both the content to be learned and the sequential steps appropriate to the individual learner. It may be visualized in the form of a pyramid, with each substantive stratum resting on a more fundamental one, and with the capstone representing the intended skill to be learned. Thus, for example, if the apex represents breaking the code in reading English, somewhere on the pyramid there is a stratum representing discrimination of visual symbols. However, tactically one learner may rely on contextual cues while another works better with letter or word configurations. Conceptually, therefore, the pyramid may be the same for both learners. The layers would be arranged in a uniform sequence, but the color or design of each layer would vary to fit individual differences.

There is already mounting evidence to show that the organization of instructional content influences learning success both with handicapped and non-handicapped children. Phillips and Haring (1959) tested the hypothesis that the emotionally disturbed child lacks order or structure in his environment and in his emotional-educational life. They therefore designed a carefully structured program with two special classes of emotionally disturbed pupils and found that the children's exposure to this kind of environment for two years resulted in significant academic, social, and emotional gains over those in a less structured situation. Similarly, Grimes and Allinsmith (1961) tested a highly structured beginning reading program with pupils judged to be compulsive and anxiety-ridden, and discovered that such a program is likely to produce better school achievement than the conventional, more informal approach to teaching beginning reading. In the rapidly developing field of programmed instruction, there is additional evidence on the effects of structure. Stolurow (1964), for example, did two programmed instruction sequences to teach arithmetic facts. In one program he ordered the content logically so that students could anticipate next stages in the sequence. For the second program, he scrambled the sequences without changing the content. He then compared the performance of high- and low-ability groups on both programs. The results showed that in the logically sequenced program, there was little difference in achievement between the two groups. How-

ever, in the poorly arranged sequence, the group differences were considerable. Apparently, when the organization of content was orderly, there was no need for the brighter children to summon special intellectual resources to master the material; those with less ability could handle it just as well. But when the organization was disjointed, the more able pupils were better equipped to overcome the impediment of inadequate instruction. These results would suggest that, for every bit of material to be learned, there is a threshhold level of tested intelligence beyond which I.Q. increments are unnecessary for successful learning, provided the material is packaged properly and presented in optimal environmental conditions via the most efficacious strategies.

Because it figures predominantly in the transmission process, the design of content is a vital component in taxonomic instruction. Indeed, it constitutes one of the two elements of the Taxonomy—the "what" of instruction (the other being the "how"). This element is detachable to make room for other content either for the same pupil population or for another one. For example, a comprehensive, sequenced message in reading or number skills for an educable population would be inappropriate for trainables, whose message might be designed around activities for daily living. The differences in taxonomic design may not be confined just to content. The two groups probably function better in different kinds of learning environments and respond to different arrays of strategies.

Atmospheric conditions (or learning environments) are also vital to a communications system, although they figure only secondarily in the Taxonomic model. Such conditions can be physical as well as social. On the basis of laboratory experiments, Cruickshank and associates (1961) suggested that distracting stimuli in the learning environment of brain injured and hyperactive children be carefully controlled in order to prolong their attention to educational experiences. Hewett (1968) includes a detailed floor plan as an appropriate context for his task, reward, and structure triangle of learning for the emotionally disturbed. In studies by O'Connor and Tizard (1956) it was demonstrated that imbeciles were able to improve certain skills sharply when social conditions in their workshop were manipulated. On a grander scale, the Re-ed program for emotionally disturbed children is regarded by at least one of its protagonists (Hobbs, 1966) as a temporary part of the child's ecological system, including his family, his school, his community, and the social agencies therein. As such, the program's strategies are designed to involve these environmental units in behalf of the child. A new kind of mental health worker, the liaison teacher, maintains contact with the child's regular school in order to facilitate his eventual return to one of its classes. Similarly, the social worker reaches out to the family, the community agencies, and to individuals who might contribute to the total environmental impact upon the child who needs help. Hobbs suggests that "the goal is to make the system work, not simply to adjust something inside the head of the child."

Unquestionably, the major concern of the Taxonomy is the transmitter (teacher), not so much its internal wiring system system (personality, etc.), but rather its ability to send effective messages. Stated another way, the Taxonomy is concerned with increasing the number of instructional wavelengths of any given transmitter so that a larger number of receivers (learners) will be able to incorporate and make use of the messages. Many teachers tend to operate within a narrow range of the large but finite number of strategies that are possible to employ. Some teachers, for example, prefer working with the total group either in a lecture-demonstration or seminar approach, while minimizing tutorial contact or structuring self-instruction sequences for pupils. There are also signs of teacher favoritism in selecting sensory modalities through which pupils are expected to receive messages, and output channels through which pupils are supposed to respond.

The problem of underutilizing the transmitter by restricting the wavelengths on which it operates is that some receivers are not wired to receive messages most clearly on these wave-

lengths. Or even in instances where the best wavelength for transmitting messages has been located, staying on it for prolonged periods of time may diminish the transmission effect. This kind of consistency helps define a teacher's individual instructional style, for whatever that is worth, but the net effect is like playing the proverbial one string fiddle. Lacking are at least two factors which have been shown to contribute to cognitive performance, i.e., novelty (Zeaman, House, and Orlando, 1958) and the skillful organization of instructional content (House and Zeaman, 1960).

The Taxonomy operates on the premise that instructional behavior is both idiosyncratic and describable. Consequently, it is possible to analyze the preferred strategies of a given teacher. Using this analysis as a point of departure against a backdrop of the total range of strategies offered by the Taxonomy, it is then possible to enlarge systematically the instructional repertoire of the teacher; that is to say, it is possible to increase the number of operating wavelengths.

The Taxonomy attempts to help the transmitter function in ways that are varied but disciplined and rational. The teacher who familiarizes himself with its catalog of behavioral alternatives no longer has to rely so heavily on his personal predilections in deciding on the "what" and "how" of instruction. Instead, he takes as many cues as he can from the learner (receiver) and systematically varies his strategies (wavelengths) to determine which elicits the most interest and involvement. When variation in strategy is systematic and responses are processed for improving decisions on strategies in the future, then the whole approach becomes a self-correcting, scanning operation. Without such a feedback loop and constant reappraisal, it can resemble a blunderbuss type of transmission system that remains diffusively inefficient.

The Roles and Qualifications of the Instructor.

In performing his instructional tasks, the teacher requires specific competencies that fall within the limits of his instructional role. These are basic to any classroom situation regardless of whether he employs the Taxonomy or another approach to prepare and carry out lessons in the tool subjects. One particularly useful definition of instructional roles and attendant skills for teachers of children with learning handicaps was suggested by Lazarus (1969). Viewing the interaction process between the teacher and his pupils, she characterizes him as observer, recorder, analyzer, transducer, transcoder, transmitter, and evaluator. These tasks require some specific supportive skills, as follows:

I. The teacher as observer:

- A. Is able to use an observation schedule to record normal and deviant behavior
- B. Is able to record ten-minute samplings efficiently, so that any student can translate findings for analysis
- C. Is able to apply a behavior analysis technique to determine *tentative* hypotheses of developmental levels of the child

II. The teacher as recorder:

- A. Is able to administer individual and group tests to refine hypotheses (formal and informal) regarding the pupil's general information
- B. Is able to design informal tests for purposes of group or individual assessment of specific competencies

III. The teacher as analyzer:

A. Is able to compile a summary of behavioral and cognitive aspects of a child's behavior from observations and records (description)
B. Is able to set up a profile of these competencies (assessment)

IV. The teacher as transducer:

A. Is able to participate in interdisciplinary conferences and interpret his own findings to others
B. Is able to assimilate into his own analysis information and observations from other disciplines
C. Is able to synthesize this feedback and amend his own analysis

V. The teacher as transcoder:

A. Is able to set up tentative short- and long-term objectives for instruction of the child
B. Is able to describe terminal behavior desired for short-term components
C. Is able to analyze the learning task
D. Is able to analyze the medium (materials for instruction, etc.)
E. Is able to make competent decisions on modes of instruction to attain goals

VI. The teacher as transmitter:

A. Is able to set up the physical environment for effective instruction
B. Is able to communicate by appropriate verbal and non-verbal symbols
C. Is able to select and competently use method and medium in presentation of the concept or skill to be learned
D. Is able to instruct individuals, small groups, and large class groups
E. Is able to involve each child in instructional transaction

VII. The teacher as evaluator:

A. Is able to use feedback from all functions (I through VII) to recast any and all approaches
B. Is able to use media for self-study and self-criticism (e.g., tape recorder, film, video-tape, computer assistance, etc.)
C. Is able to share successes and failures and teaching-learning experiences during group evaluation with colleagues in allied disciplines

TARGET POPULATION AND SCHOOL SETTING

The target group for the Taxonomy has consisted of children in special public day schools in New York City, sometimes called "600" schools, for the behaviorally disordered. Thus far,

the project has serviced two "600" schools that are similar in pupil enrollment and background. Each provides instruction and other helping services for less than 200 boys, age 10 to 15. The overwhelming majority of them come from minority groups in disadvantaged areas and bring with them long histories of behavior deviance in their sending schools. They are assigned to the "600" schools principally because their acting-out behavior in the regular classrooms is judged by school officials to be so unbearable that it is necessary to separate them from their more controllable peers. Hence, decisions for sending children to the "600" schools are based on manifest disruptive behavior rather than on clinical diagnosis.

Once absorbed into the "600" school, students are placed in small-sized classes and provided with more guidance, remedial, social and psychological services than are found in regular schools. It is hoped that after some exposure to such a program they will be ready to return to their former classrooms. However, most remain on until they are legally allowed to leave school.

Although the primary reason for sending children to "600" schools is disruptive behavior, the overwhelming majority of them suffer from severe educational retardation. Well over fifty per cent of the children in the project receiving Taxonomic Instruction entered the special school at least three years below grade average in reading, many of them functioning at no better than the readiness level. It takes little imagination to appreciate their desperate need for success experiences and a feeling of self-worth. Their long history of achievement difficulty and an inability to get along with teachers and classmates went hand-in-hand with a record of poor motivation toward school work.

The teachers at the "600" schools are probably representative of the staffs in regular public schools, since there is no special certification for teachers of the behaviorally disordered in New York City. In terms of teaching competency, they would probably be judged by their supervisors as ranging from mediocre to outstanding, with the large majority well within these extremes. Before commencing with the project, the director and his associates conducted an informal survey on teacher-pupil interaction, and the following observations emerged as foremost:

1. In addition to severe learning difficulties among the pupils, it was also obvious that their attention span was short, their interest in the instructional program minimal, and their success expectations low.

2. Group instruction predominated, with teachers and pupils engaged in a kind of catechismic dialogue in which teachers did more than 90% of the talking and the pupils responded in short phrases, often in one-word answers.

3. Lessons did not often unfold in a logical step-by-step sequence building from the simple to the more complex. Sometimes the teacher's point of entry was at too high a level and the link from one step to the next was more than the pupils could manage.

4. Pupils did not always see closure at the end of a lesson. The objectives of the lesson were not clear enough to determine whether or not they had been reached.

5. Teacher's difficulties in getting the lesson across often increased the tension between teacher and pupils, thus reducing the ego-supportive effects of the learning atmosphere. Pupil restlessness and pupil indifference were not uncommon during a lesson.

To what extent are mismatches between teacher and pupil styles common in the "600" schools? It is hard to say, principally because there is relatively little information on how distinctive and effective the programs in these special schools are. They were originally

founded in 1946 for the education of children exhibiting severe behavior problems in regular classrooms. These children have been characterized by regular school officials as emotionally disturbed, disruptive, disrespectful, and hostile to authority, and therefore constituting a threat to their own safety and welfare as well as to that of their fellow pupils. The "600" school attempts to create for them a therapeutic environment with abundant professional help in order to redirect disruptive behavior into purposeful learning activity. There have been occasional criticisms of the program by various citizen groups. The main charges are: the schools are segregated, pupils are received without appropriate screening procedures, the teachers are not sufficiently trained, provide inadequate guidance, and administer corporal punishment. Despite these attacks, however, the "600" schools have increased more and more rapidly during the 25 years of their existence, and their current enrollment is well over 5,000 boys and girls, ages 5 to 21.

Throughout the history of "600" school growth, the New York City Board of Education has sensitized itself to public criticism and has shown constant concern about the quality of programs they offer. One major self-investigation was conducted from June, 1964 to February, 1965 with a special staff committee appointed by the Superintendant of Schools. In their report, *"600" Schools Yesterday, Today, and Tomorrow*, they recommended, among many other things, that the schools be maintained (while removing the stigmatizing "600" number of classifications) and that bold steps be taken toward strengthening the instructional programs. A need for improved instructic expressed by the Review Committee reflected a long-standing similar concern by the professional staffs in these schools. Principals and teachers regarded school failure as a persistent problem, and a lack of sufficient progress toward a solution was hampering rehabilitation efforts.

An independent study one year later, conducted by the Center for Urban Education (Tannenbaum, 1966), disclosed that despite the acknowledged need to increase the schools' effectiveness in therapeutic and remedial services, it was apparent that the children were receiving benefits they would not ordinarily receive in a regular school. The Taxonomy Project offers an experimental mechanism for accelerating the realization of the "600" schools' educational objectives.

PRINCIPLES OF TAXONOMIC INSTRUCTION

Taxonomies are used mostly in the biological sciences as means of classifying living things according to basic schemes of organization and interrelationship. When Bloom and his associates (1956) applied the concept to educational objectives, they hoped that it would improve communication in the school world as it had in the natural sciences. They intended it to be "a method of improving the exchange of ideas and materials among test workers, as well as other persons concerned with educational research and curriculum development." Such a classification system could be achieved by "selecting appropriate symbols, giving them precise and usable definitions, and securing the consensus of the group which is to use them." Similarly, the Taxonomy of Instructional Treatments is a classification system intended to systematize substances and strategies of instruction for handicapped children. Thus far, it has been applied to behaviorally disordered, educationally retarded boys, ages ten to fifteen, but it is intended to be adaptable to other handicapped populations as well.

As noted earlier, the Taxonomy limits its concern to the instructional aspects of teaching, specifically the pupil's engagement in absorbing adaptive basic skills and concepts. These skills are broken down into logical substructures called sub-skills, as a means of specifying their component elements. The next step is to translate them into instructional materials and non-material instructional stimuli that are pitched not only at the learner's level of function-

ing but also at his preferred channels of reception. In this case, preferred channels include the sensory modalities that absorb for him the clearest messages, and enable him to express himself most clearly, the instructional styles or tactics that are most effective in firing his interest, and the social setting in which he learns most comfortably. The teacher's instructional goal is to achieve a "goodness of fit" between the pupil's functioning capacity and preferred learning style on the one hand and the organization of content and strategies for instructional transmission on the other.

Some Operational Hypotheses.

Among the major tasks of the project is to test some hypotheses that may well determine how reliable and valid the Taxonomy is. One such notion is that for each learner, handicapped or not, there is a unique set of strategies best suited to lock him into a learning task at a given moment in time. The exact nature of this uniqueness is wide open for speculation. It may be stable, definable, and therefore useful for teachers to know about when they plan instruction. For example, if a child learns best through audio-visual puzzle play in a tutorial arrangement with his teacher during one short period, it is possible that he is generally most responsive to that kind of strategy. Another possibility is that these strategy preferences are not at all stable, the child's strongest responsiveness being simply to novelty. In this case, the question arises as to whether novelty per se attracts and sustains his attention or if it must be limited to a set of alternatives that is unique for each learner. The Taxonomic scheme suggests that for most learners, including the handicapped, there are distinctive inventories of strategies which contain the most engaging options. Thus, for example, one child may prefer his stimuli to be visual or intersensory, provided the visual modality is included, while another may prefer the haptic, kinesthetic, or tactile. The first child may respond best to stimuli packaged in a game or puzzle form, provided that it is not competitive, while the second may function best in the give and take of a test response or competitive game situation. Besides the differences in *kinds* of preferred alternatives for the two children, there may also be differences in the *number* of alternatives for packaging the instructional stimuli. It is also possible that the nature of preferences is not just a random grab-bag, but is marked by commonalities instead. Just how supportable any of these notions turn out to be when they are tested empirically remains to be seen. Especially among behaviorally deviant groups, it may be difficult to discover meaningful signs of responsiveness to instruction. Some unstable children are so erratic and unpredictable in their response patterns that no combination of instructional stimuli seems to produce sustained attention for more than a short period of time. Still, the teacher has to be adroit enough to shift from one strategy to the next either to achieve or to maintain engagement, and this is possible only if his arsenal of strategies is abundant and systematically organized.

A second major hypothesis being tested is that the teacher's ability to regulate a pupil's engagement in the learning experience has both scholastic and therapeutic value. Engagement is defined simply as responsiveness and attentionality to instructional stimuli. It refers to the *superficial* signs of being locked into a learning task, even though these signs may fail to reveal the apparent day-dreamers who are engaged and the apparently engaged who are day-dreaming. It is virtually impossible for classroom observers to distinguish the misclassified pupils who are probably so few in number that it is not worth the effort.

It is expected that engagement will be the barometer of success of the Taxonomic process. To the extent that the teacher's efficiency in manipulating engagement affects or reflects his control over children's learning and behavior, it stands to reason that the amount of time a pupil is attending to sequential instructional stimuli should figure as a criterion variable. There are, of course, points of diminishing return brought on by fatigue or other forms of discomfort. There are also different rates of learning between individuals that determine how much

attention is needed to reach specified learning goals. However, within these human restrictions and variations, it is logical to expect learning to progress during periods of engagement, and the teacher's ability to regulate it may be one of his few means of helping pupils realize their potentials. In fact, there is some peripheral evidence to show that a teacher's failure to engage the pupil's attention to important elements of the learning task could be misconstrued as the pupil's failure to show learning capabilities. In their series of experiments with moderately retarded children whose performances on visual discrimination tests were lower than their mental age would indicate, Zeaman and House (1963) found that "the secret of successful training [of the sample population] lies in the engineering of their attention. In training tasks which require discrimination, one should seek ways of increasing the attention value of the relevant cues." They conclude that these children need to acquire a chain of two responses: "(1) attending to the relevant stimulus dimension and (2) approaching the correct cue of that dimension."

Pupil engagement may facilitate therapeutic intervention no less than instructional progress. Regardless of whether insight or behavior therapy is employed, there is a prerequisite need for rapport between clinician and client, which can only be accomplished through engagement. The teacher can set the stage for other helping services by involving the pupil more frequently in learning experiences, thus reducing the chances of his feeling alienated from school life in general. Then, too, if engagement is an essential ingredient of successful instruction, it can contribute directly to therapy. There is evidence (Roman, 1957) to show that in community mental health programs a combination of formal instruction and psychotherapy has a more positive effect on delinquent behavior than does either of the two approaches separately. This finding would suggest that skilled instruction could be instrumental in achieving a non-academic goal provided that it combines with measures designed to realize these goals independently. An explanation of this spillover effect may well be contained in Escalona's (1967) characterization of the importance of individual competence in the healthy integration of personality: "The experience of learning and the perception of the self as one who can learn, generates a sense of the self as an active being, and a sense of the self as the carrier of power and of competence. It also makes available a source of pleasure and of satisfaction that is not directly dependent upon the quality of inter-personal relationships. Last, not least, each instance of successful learning makes the world more intelligible. Words, concepts, metaphors, and physical phenomena that are bewildering, out of context, and hence alien, become components of a comprehensible and orderly environment in consequence of successful learning."

Objectives of the Taxonomy.

If each learner is distinguishable in terms of the organization of content and instructional strategies that are best suited to engage him, and if engagement figures strongly in school achievement and behavior change, then it is the teacher's task to plan instruction with these factors in mind. Specifically, it means that he has to prepare his instructional stimuli so systematically that he becomes conscious of the kinds of instructional acts that elicit greatest interest. The scanning of alternatives may have to be done at first through trial and error, using the Taxonomy's classification system as a guide, but as the teacher becomes more skilled in working with the scheme, he will notice that some of the choices open to him seem to be better bets than others in engaging the learner. Research may eventually reveal that there is a normative hierarchy of strategy preferences among specific populations, with individual differences revealing themselves within the normative picture. Experimentation with the Taxonomy will hopefully reduce the need for trial and error in matching instructional tasks, transmission style, and learner. This will be accomplished as more knowledge is gained on the relationship between the learner's under-the-skin characteristics — cognitive and non-cognitive — and his instructional tactes.

Linking the best possible communicative connection with the learner is the teacher's first responsibility and the Taxonomy's first objective. Success in this is defined here as individualizing instruction. The teacher who individualizes instruction through the Taxonomy has located the strongest wavelengths between himself (as transmitter) and the learner (as receiver) -- he has sought and found the child's strength and is capitalizing on it. It should be noted, however, that in its present context, individualization does not have the usual meaning of prescriptive teaching on a one-to-one basis. Instead, it is a sensitization to the child's individuality. Some children may indeed be most easily engaged by a tutorial approach, so for them it would be individualization; others, however, may connect better to different grouping arrangements which would be individualizing for them. The point is to discover what is best for each child and to gear instruction accordingly.

The second and ultimate goal of the Taxonomy is to move the pupil from individualized to personalized instruction in which engagement control is maintained even through hitherto unfavored strategies. In other words, while individualization implies the location of the best wavelength between transmitter (teacher) and receiver (pupil), personalization involves the improvement of reception on an increasing number of wavelengths. Hence, the Taxonomy which systematizes the total range of instructional substances and strategies is a *facilitator* for attaining individualization and then becomes a *catalog of criteria* for determining how much personalization is being achieved.

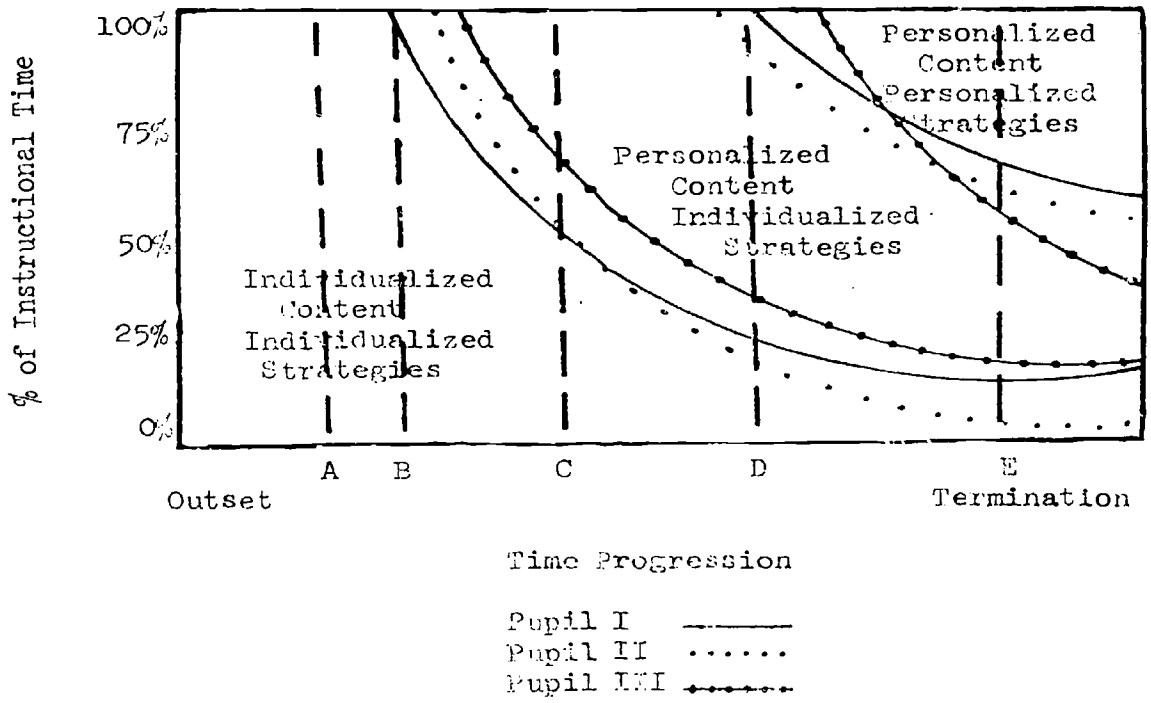
The reasons for personalizing instruction are based on social reality. The everyday environment in and out of school demands that learning take place under various conditions some of which may not be favored by a given child. Such a child may prefer, for example, to work with a tutor, and he may find it difficult to sustain his attention when he is being lectured at in a large group. Or, he may be more comfortable working with programmed instructional materials than in a test-response situation. But since he will not always have tutorial services at his elbow and programmed sequences prepared for him whenever he needs them, he has to be helped to broaden his areas of receptivity. For the teacher, it involves planning carefully to deal with weakness (i.e., personalizing instruction) after working primarily on strength (i.e., individualizing instruction), but it is healthier for pupil and teacher if the latter plans an encounter with weakness than if he stumbles into it.

Before the progression from individualization to personalization can begin, intensive diagnosis must take place, the aims of which are somewhat unorthodox. Whereas diagnostic programs for handicapped children usually tend to produce cognitive profiles in order to build up areas of *weakness*, the purpose here is to clarify areas of *mastery* and to work within them in order to build up an inventory of success experiences. Once the pupil's learned skills are discovered, he is given exercises in them by means of a carefully monitored rotation of strategies outlined in the Taxonomy. This procedure is intended to locate his preferred strategies. Having identified the knowledge of content and most promising strategies for each pupil, the teacher can individualize instruction, thus demonstrating to children with long histories of school failure that they are able to perform successfully, albeit within restricted areas of content. Only then, after the child has experienced success, is the cognitive profile obtained by the diagnosis used to build up areas of weakness.

The progression from individualization to personalization is at first successive and then simultaneous. Figure 2 illustrates the time schedules for Pupils I, II, and III. To illustrate various aspects of the progression, vertical lines have been drawn through Figure 2 at various points on the time progression line. All students begin their program spending 100 per cent of the time engaged in individualized content administered through individualized strategies. At Point A on the time progression line, the teacher is still prescribing a totally individualized instructional program, even though some time has elapsed since the outset of instruction.

Figure 2

Sample Schedules of Individualization and Personalization for Three Pupils



At Point B, Pupil I enters into content areas that he has not yet mastered (personalization), but the strategies remain individualized in order to ease the pupil over the hurdles with maximum engagement. As Pupil I moves through the program, the proportion of instructional time spent on individualized content and strategy is reduced in order to make more room for personalized content while still keeping the strategies individualized. In fact, the vertical line at Point C intersects the arc representing Pupil I at a point which reveals that 50 per cent of the instructional time is now being spent with a totally individualized program while 50 per cent of the program involves personalized content administered through individualized strategies.

At Point D in time, Pupil I enters the third and final stage in which personalized content and strategy are introduced. Again, as time goes on, the proportion of instructional time spent on totally personalized instruction is increased. It can be seen that the vertical line at Point E divides the instructional time into three portions: 12 per cent of the time the child is working with a totally individualized program; 53 per cent of the time with a program of personalized content and individualized strategies; and 35 per cent of the time with a totally personalized program.

Three features of the progression represented in Figure 2 should be noted: Each arc representing a student's progress at various points in time is asymptotal to the baseline, indicating that the proportion of time spent on each kind of activity is constantly changing and that none of the earlier stages are ever eliminated entirely. Also, the time schedules for all

three pupils show allowances for individual differences. Each enters the new stages at different points in time and each spends a different proportion of time in the three kinds of activity. Lastly, the terminal point of instruction is arbitrary. It could denote the end of a semester, a year, or even more. The length of time is not important; only the way the time is spent concerns us here.

THE TAXONOMIC MODEL: ITS STRUCTURE

As noted earlier, the Taxonomy systematizes the teacher's stylistic repertoire by classifying the behavioral alternatives open to him during the instructional act. It does so by providing criteria for assessing the child's learning status and his way of interacting with a formal instructional stimulus. It allows the teacher to determine which basis skills and related subskills the child must master; at what difficulty level this content can be learned; the communications input that conducts maximum responsiveness; the instructional mode that engages the attention and fixes interest in the learning task; and the instructional method of grouping to provide the most supportive, distraction-free environment for learning.

In order to operationalize the teacher's strategies, it is necessary to create and assemble instructional materials that will plug appropriate content into every specified instructional style. Once the teacher has determined precisely what skills to administer, he elects the preferred instructional content and teaching behavior from the array outlined in the Taxonomy. He is then guided to the instructional aids that fit the requirement by the Taxonomic code system which forms the indexing scheme for the materials. The task of the curriculum specialist is to keep the library and its instructional aids stocked in such a manner as to fulfill the content and teacher behavior specifications suggested by the Taxonomy. Thus, a diagnosis of individual learning needs is directly applicable to an educational catalogue that provides sources of methods and materials to match the diagnoses. As most teachers move from the formal or informal diagnosis of a child's functioning capacities to the selection of appropriate instructional materials, the Taxonomy provides them with an intermediate step which is the determination of appropriate instructional content and strategy. The result is a new dimension of prescriptive teaching and a broad diversification of approaches to instruction.

The Taxonomic model designed for the "600" school population contains seven components, three subsumed under content (or the "what" of instruction), and four under strategy (or the "how" of instruction). While the content area could be any of the so-called tool subjects the one chosen for the present target group was reading since retardation was so desperately severe in this vital skill area. After spending at least five years in regular classrooms, most of the children had but the skimpiest knowledge of the alphabet and a sight vocabulary no greater than that of a first grader at the readiness level. Content and strategies were therefore indexed under the following seven categories:

I. **Basic Skills:**

1. Cognitive-Perceptual
2. Language Analysis
3. Comprehension
4. Study Skills

II. **Basic Sub-Skills** (grouped under the respective basic skills):

Cognitive-Perceptual:
1. Symbolic Discrimination

2. Memory Span
3. Directionality and Laterality
4. Time Relationships
5. Space Relationships

Language Analysis:
1. Consonants
2. Vowels
3. Vocabulary
4. Word Structure
5. Syntax

Comprehension:
1. Main Ideas
2. Details
3. Sequence-Relationships
4. Word Meaning
5. Context Inference
6. Critical Analysis
7. Recreational Reading

Study Skills:
1. Skimming
2. Dictionary
3. References in Text
4. Maps, Graphs, and Tables
5. Speed and Accuracy
6. Other Sources and Processes

III. **Sequence Levels** (i.e., A categorization of materials according to degrees of difficulty for the target "600" school population):

1. Grades 2 and below
2. Grades 2-4
3. Grades 4-6
4. Grades 6 and above
5. Ungradable
6. Multi-level

IV. **Instructional Methods** (i.e., Ways of organizing pupils for a formal teaching-learning experience):

1. Teacher-Total Group
2. Teacher-Small Group
3. Teacher-Student
4. Student-Total Group
5. Student-Small Group
6. Student-Student, Tutorial

7. Student-Student, Tandem
8. Individual Self-Instruction

V. Instructional Modes (i.e., The transactional styles between the learner and the teaching stimulus):

1. Play-Chance
2. Play-Competition
3. Play-Puzzle
4. Test-Response
5. Exploration
6. Programmed Response
7. Problem Solving (Convergent)
8. Problem Solving (Divergent)
9. Exposition
10. Role-Playing

VI. Communication Input (i.e., The learner's sensory modalities available for mediating the instructional stimuli):

1. Visual
2. Auditory
3. Motoric (haptic, tactile, and kinesthetic)
4. Auditory-Visual
5. Visual-Motoric
6. Auditory-Motoric
7. Visual-Auditory-Motoric

VII. Communication Output (i.e., The channels to be used by the student to demonstrate the correctness of processing information received by the input channel):

1. No Response
2. Oral Response
3. Motoric Response
4. Oral-Motoric Response

Content, or the What of Instruction

It should be carefully noted that in the present context, the term "content" has a dual meaning. It refers not only to the substance that has to be learned but also to the way it is organized or packaged for instruction. Content is the subject matter which can be touched, seen, or heard by the pupil; it is the structure and sequence of the message in contrast to the style and tactic of its transmission. Thus, for example, color-coding the alphabet is an example of a variation in content, whereas presenting it visually for exploratory purposes to a small group of pupils is a variation in strategy.

Since the Taxonomy has been prepared initially to implement reading instruction, there are obviously a great many alternative ways of designing the content which might have made a difference in the pupil's success at mastery. The present organization is admittedly arbitrary, but in the absence of anything resembling definitive insights into the relative values of substantive programs for children with different kinds and degrees of handicap, it was decided that the present organization could serve as a serviceable beginning with the understanding that changes should be made in its design as more and more evaluative evidence becomes available. For purposes of clarification, it may be useful to identify its position in Woolcock's (1965) classification model of approaches to the teaching of reading, which incorporates a comprehensive array of programmatic possibilities for handicapped children. As indicated in Figure 3, the model is three-dimensional, incorporating variations in the nature of the symbol system, the degrees of pre-structuring, and synthetic-analytic code breaking sequences. Illustrations of the various symbol systems are as follows: Uncontrolled traditional orthography (typified by conventional reading materials), modified traditional orthography (e.g., color coded or diacritically marked reading content), controlled traditional orthography (e.g., spelling systems without irregularities), phonetic alphabets (e.g., new phonemic systems such as Initial Teaching Alphabet), and rebus material (e.g., transitions from pictures to words). Examples of high prestructure materials are the programmed learning sequences; low pre-structure could be noted in experience charts; and medium pre-structure is found in basal readers. A flow from analytic to synthetic content might start from the composition of experience charts, continue with an analysis of word components, and then to an analysis of sound components. The reverse would be the sequence if the starting point were synthetic and the terminal were analytic. A mixture of the two could be found in some programs, notably the McKee-Harrison Basal Reader Series.

Basically, the content of the first experimental version of the Taxonomy is confined to uncontrolled traditional orthography as the symbol system and ranges across low, medium and high pre-structure as well as mixed analytic-synthetic sequences. No attempt was made to vary the symbol system under carefully controlled conditions in order to determine the relative main effects of the various alternatives. However, there is certainly room for evaluating different symbol systems filtered not only through variations in pre-structure and synthetic-analytic sequences, but also through different strategies (i.e., communication channels, instructional modes, and instructional methods) classified in the Taxonomy. Comparing variations in strategy as defined here would represent a departure in methods of evaluating different approaches to the teaching of reading which deal primarily with the effectiveness of content. It is also noteworthy that Woolcock's classification model confines itself mostly to the language analysis skills outlined in the Taxonomy. No attempt is made to include cognitive-perceptual, comprehension, and study skills which further elaborate the code breaking process in reading and are regarded as important emphases in a reading program for the "600" school population.

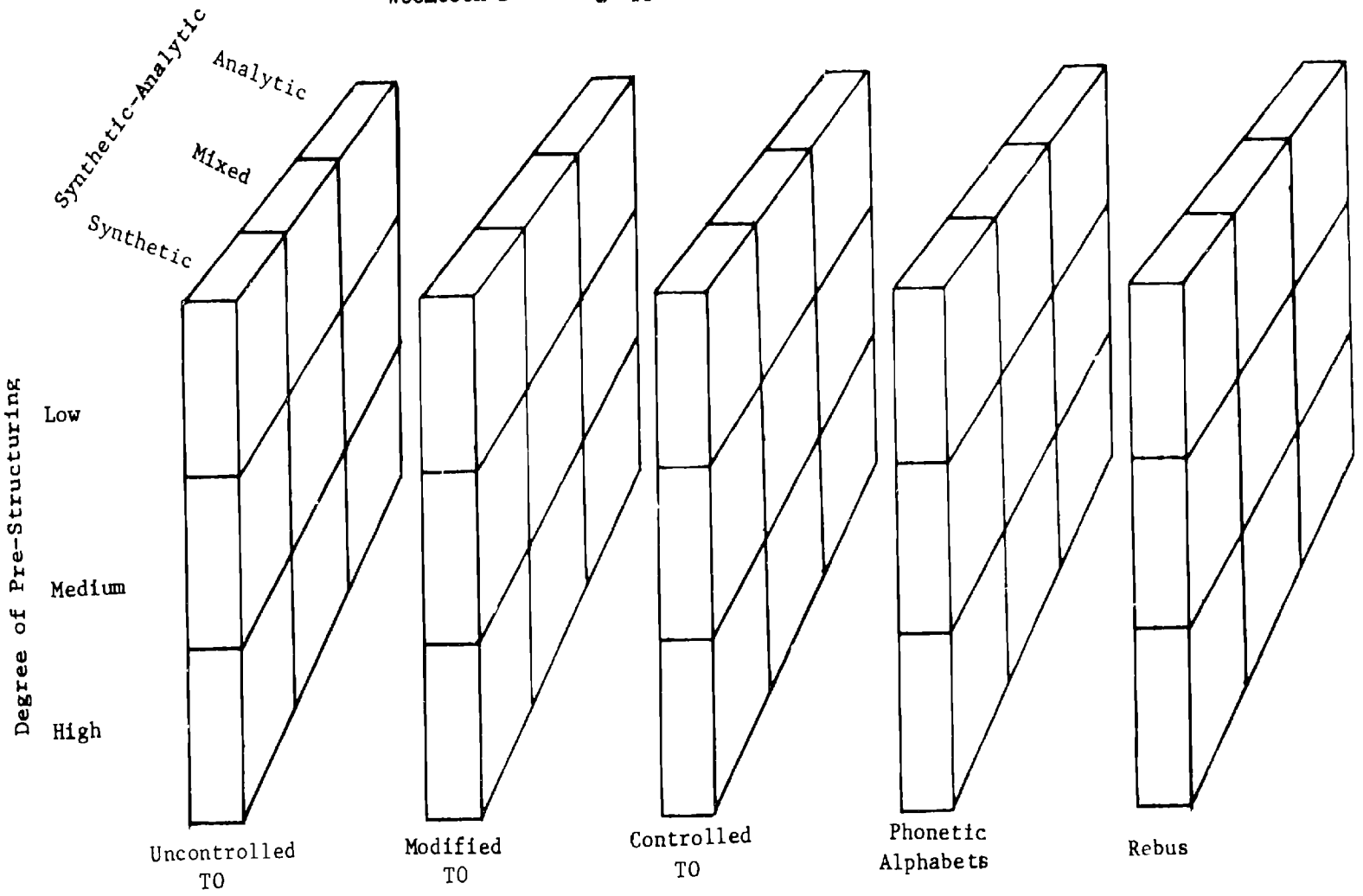
Strategies, or the How of Instruction

While content encompasses the substance and format of instruction, strategies denote the teacher's behavioral style in administering the instructional stimulus. Sometimes, as in the case of individualized self-instruction, the learner interacts with the stimulus itself rather than with the live teacher. The strategy then refers to the teacher's advance planning of that encounter.

Another important note in defining the strategy section is that it is designed to cover the options open to the teacher in the most parsimonious way possible. As a result, precision has been sacrificed for the sake of practicality. Each item in the four dimensions of strategy could have been broken down to finer differentiations that could make

Figure 3

Woolcock's Reading Approach Classification Model



differences in the instructional process, but the resultant list would be so extensive that the teacher would be overwhelmed if he had to select from the myriad choices. Although examples could be cited from anywhere in the strategy (or even content) section, it may be useful to elaborate on just one, with the understanding that similar elaboration could be made throughout the Taxonomy. In the instructional method category, one of the options is individual self-instruction, which can be approached in more ways and with more varying effects than is often supposed. Research by Gotkin (1964) on children working alone with programmed instruction materials indicates signs of boredom if the isolation is prolonged for extended periods of time. Some confirmation of these findings could be derived from Kress' (1966) investigation of programmed learning under different administrative conditions, which showed that many sixth and eighth graders could not exercise the necessary self-discipline under individual, self-paced conditions. As for the effects of individualized self-instruction under conditions which allow for social interaction, the evidence is not yet conclusive. Kress (1969) compared three kinds of interaction on groups of four eleventh graders working on a programmed instruction sequence on atomic physics. Using various performance measures as criteria, he found little basis for favoring interaction over isolation. Moreover, allowances for social interaction clearly inhibited the students from completing the sequence as rapidly as they would if each worked alone. So we see that individualized self-instruction in the Taxonomy has its own little universe of alternatives which need to be evaluated in different populations of handicapped children. Multiply these potential differentiations within every sub-category of content and strategy, and the Taxonomy becomes so overwhelming that it ceases to function as the practical model it is intended to be. Factorial studies may eventually show that variations of impact are greater within a Taxonomic sub-category than between categories, in which case the sub-categories would have to be labeled differently than they are now. Until then, the present form of the model is posited as a reasonable beginning, subject to modification as meaningful empirical data mount.

Preferential grouping arrangements depend on a variety of variables, including dimensions of personality among pupils and the teachers. Thelen (1967) has investigated the problem of selecting children to form the kind of group that would fit best in working with a particular teacher. His concern is with the initial organization of the class as a social unit, rather than the options for sub-group arrangements to maximize engagement in the classroom, which is the focus of the Taxonomy. It is quite possible that both kinds of grouping emphases have to be considered simultaneously because they affect each other. The criteria for selecting children to form a class may influence the outcomes of different kinds of grouping arrangements within the classroom. On the other hand, the teacher's sensitivities to alternative ways of grouping for learning could modify the criteria for pupil selection by influencing the teacher-pupils' goodness of fit.

Just as instructional methods (i.e., grouping schemes) need to be differentiated to accommodate pupils' preferred learning styles, the same is true for instructional modes. The varied possibilities suggested in the Taxonomy make possible a search for a normative hierarchy of preferences as well as an adjustment to individual differences. There is as yet little information to suggest which modes engage pupils most consistently in learning activity. There is some inclination among researchers, however, to explore the properties and possibilities of play activity in relation to learning behavior. According to Piaget (1951), the development of play habits relates closely to stages in the growth of intelligence which are best understood in terms of the mechanisms of assimilation and accommodation. Play starts in the sensory-motor period, the earliest of the four in intellectual development, and could be illustrated by the four-month old child coordinating its ability to command touch by pushing a toy hanging over its crib in order to make it swing or rattle. He experiences an aspect of assimilation, with pleasure deriving from repetitions of successful acts and proceeding toward a quest for variation. During the stage of representational intelligence (from about age two to seven), play is character-

ized by make-believe and symbolism. As the child grows into pre-adolescence, the highly individualized symbols undergo change through his increased sensitization to social activity and consensus. As reasoning becomes more logical and objective, play takes on rules that discipline the individual, particularly in a group game situation. The adaptive aspects of play never entirely replace its assimilative components, so while it is more reality based in adolescent and adult years, there is always room for distorting reality in order to suit the player's needs.

The case for games as among the most powerful facilitators of learning is forcefully argued by Coleman (1968) who describes how goals of learning and play can be mutually reinforcing. According to him, play provides a framework within which time, action, and the roles of the participants can be circumscribed. "It establishes what one might describe as a minute system of activities, and if the game contains more than a single player (as most games do), the game can even be described as a minute social system." Under the ground rules of the game situation, learning becomes a means rather than the end in itself, the ultimate goal being success at play. Thus, the learner becomes proficient in school-work, not for its own sake but for the sake of his being a winner, and this presumably has great motivational value.

The instructional mode that has attracted perhaps the greatest measure of research attention and confidence in its value as a facilitator of learning is programmed instruction. It is impossible in a brief statement to do justice to the massive literature in the field, but there are some basic points worth reviewing for purposes of clarification. According to Dick (1965), there are four significant acquisition factors in programmed instruction: (1) The subject matter is presented systematically in sequential steps; (2) the learner becomes engaged actively in acquisition by developing an answer to a question about a given bit of material; (3) he receives immediate feedback about the adequacy of his response; and (4) he receives the next bit of information, continuing through the program at his own rate of speed. There are many variations in programmed instruction which include more than just the alternatives in grouping arrangements mentioned earlier. These have to do with questions of format, patterns of sequence (branching versus linear), reinforcement, feedback, and other ways of packaging the content. Perhaps because of these manifold considerations, it is impossible to obtain clear evidence on the effectiveness of programmed instruction. Most studies deal with program characteristics rather than comparative analyses. Nevertheless, existing evaluations seem to suggest that there are advantages to this instructional approach, even if we are not sure about how best to prepare it.

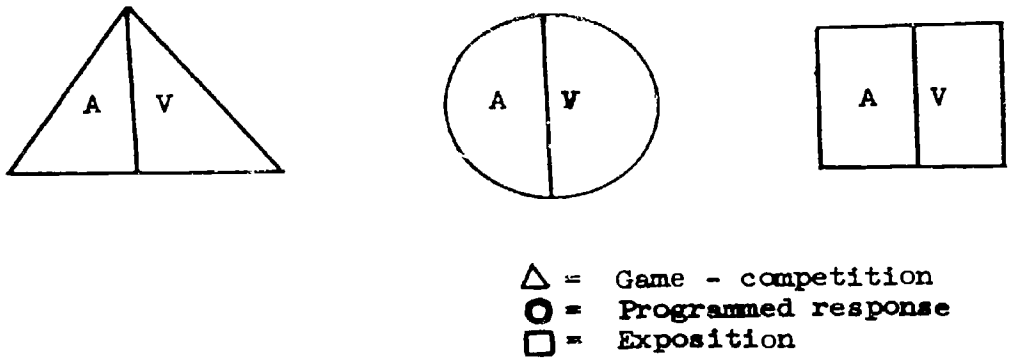
Aside from the intensive explorations of aspects of programmed instruction and other forms of self-help, there is relatively little research evidence on most other subcategories of instructional methods and modes. However, the remaining two strategy categories, namely, the communications channels, have attracted a good deal of research attention, again with indefinite results. In special education, the most fully developed application of communications theory is the development of the Illinois Test of Psycholinguistic Abilities. The communications model on which it is based was originally developed by Osgood (1952), and includes: (1) Three *processes* of language: decoding (comprehension), association (intermediary processes), and encoding (expression); (2) two *levels* of language: conceptual (meaningful) and perceptual (discrimination, imitation, etc.); and (3) three sensory input or stimulus modalities and two response output modalities incorporated into six *channels*: auditory-vocal, auditory-motor, visual-vocal, visual-motor, haptic-vocal, and haptic-motor. The Taxonomy has incorporated the input-output modalities into its scheme of strategies without systematically differentiating the processes and levels of language. The purpose here is to assess interaction effects of the four major groups of strategies so that the relative efficiencies of the different communications chan-

nels can be determined in the light of variations in instructional methods and modes. Thus, if a child prefers to receive messages through visual impact and express himself orally in a test-response instructional mode, is this auditory-vocal preference sustained across other instructional mode conditions in all grouping patterns? Samplings of studies on the Illinois Test of Psycholinguistic Abilities (Sievers, et al, 1963; Bateman, 1965) are concerned with other kinds of basic and applied issues, not the effects of strategy interaction.

For teachers, the idea of considering each communications input in the context of other strategies has practical value. For example, Figure 4 depicts the choice of sending a message to the auditory or the visual modalities via a choice of instructional modes represented by the different shapes. If the triangle represents the game of competition, the circle, programmed response, and the square, exposition (lecture or demonstration), the question is whether the child favors his eyes or ears in receiving messages presented in each of these modes. Is there consistency of preference across the modes chart? And, if there is consistency, is that type of stimulus preferred more in one mode than in the others? Similar questions apply within every category in content and strategy since the Taxonomy represents an interlocking arrangement of message format and transmission style.

Figure 4

Audio vs. Visual Stimuli Presented via Different Modes



THE TAXONOMIC MODEL: ITS FUNCTION

The first aim of the Taxonomic scheme is to implement individualized, diagnostic, prescriptive instruction. It gives the average classroom teacher specific guidelines for diagnosing learning needs and styles and for analyzing instructional materials and strategies. The teachers are forced to observe the structures and functions of instructional behavior and to understand more clearly what professional armament they bring into the classroom.

As outlined in the Taxonomy model, the teacher makes seven decisions in planning for instruction: three for Content (Basic Skills, Sub-Skills, and Sequence Level) and four for Strategy (Instructional Method, Instructional Mode, Communication Input, Communication Output). The model itemizes and codes all of the alternatives available to him

Figure 5

Taxonomy Planning Chart

The "What" of Instruction			The "How" of Instruction			
I Basic Skills	II Basic Subskills	III Sequential Levels	IV Instructional Method	V Instructional Mode	VI Communication Input	VII Communication Output
1. Cognitive-Perceptual	1. Symbolic Discrimination 2. Memory Span 3. Directionality-laterality 4. Time Relationships 5. Space Relationships	1. Grade 2 and Below 2. Grade 2-4 3. Grade 4-6 4. Grade 6 and Above 5. Ungradable 6. Multi Level	1. Teacher-total group 2. Teacher-small group 3. Teacher-student 4. Student-total group 5. Student-small group 6. Student-student tutorial 7. Student-student tandem 8. Individual self-instruction	1. Play-Chance 2. Play-Competition 3. Play-Puzzle 4. Test-Response 5. Exploration 6. Programmed Response 7. Problem Solving (Convergent) 8. Problem Solving (Divergent) 9. Exposition 10. Role playing	1. Visual 2. Auditory 3. Motoric (Kinesthetic, haptic or tactile) 4. Auditory-Visual 5. Visual-Motoric 6. Auditory-Motoric 7. Visual-Auditory-Motoric	1. No Response 2. Oral Response 3. Motoric Response 4. Oral-Motoric Response
2. Language Analysis	1. Consonants 2. Vowels 3. Vocabulary 4. Word Structure 5. Syntax					
3. Comprehension	1. Main Ideas 2. Details 3. Sequence-relationships 4. Word Meaning 5. Content Inference 6. Critical Analysis 7. Recreational Reading					
4. Study Skills	1. Skimming 2. Dictionary 3. References and Texts 4. Maps, Graphs, and Tables 5. Speed & Accuracy 6. Other Sources & Processes					
2	3	1	2	4	4	2

in making each of these seven decisions. By placing a selected code number on the appropriate cell of the Taxonomy Planning Chart (Figure 5), he reveals his instructional plan for a given child, sub-group, or total group.

The sample plans on the Taxonomy Planning Chart can be formulated and interpreted without difficulty. The illustrative seven digit number is 2312442, which means that the teacher has planned a lesson in language analysis (2), specifically vocabulary (3), at the primary level (1), to be administered in the teacher-small-group arrangement (2), in a test-response mode (4), with the teacher presenting audio-visual material (4), and the children responding orally (2). With the plan thus developed, the next step is to locate, adapt, or create instructional materials to fit into the design for the children selected. In writing his lesson plan, the teacher departs from the usual practice of assessing a pupil's needs and matching materials to them by deciding beforehand on appropriate strategies for administering these materials. Once the "what" and "how" of instruction are fit to each pupil, it is possible to record these preferences on his Diagnostic Analysis Chart (Figure 6).

Figure 6

DIAGNOSTIC ANALYSIS CHART

Name(s)	Tom Smith	Age(s)	11-5	D.O.B. 6-15-55
School	P.S. 148	Class	6-2	D.O.T. 9-30-66

	Content 1	Content 2	Content 3
I. Basic Skills	2	2	2
II. Subskills	3	3	3
III. Sequential Levels	1	1	1
IV. Instructional Methods	2, 7	2, 7	2, 7
V. Instruction Modes	1, 3	1, 3	1, 3
VI. Communications Input	1, 3, 5	1, 3, 5	1, 3, 5
VII. Communications Output	2	2	2

In the example offered, Tom Smith may have a language analysis problem (Basic Skill 2), specifically in sight-vocabulary (Sub-Skill 3). He can handle easy primary grade material (Sequential Level 1) and feels most comfortable in a teacher-directed small group or engaged in self-directed activity (of Instructional Methods 2 and 7). His interest is aroused by such teacher tactics as games of chance or puzzle play (Instructional Modes 1 and 3), particularly if the content is presented to his visual or tactile senses,

or any combination thereof (1, 3, and 5), and he is allowed to respond orally (Communications Output 2).

Teacher Planning and Information Processing.

The structure of the Taxonomy and the way it functions suggests the possibility of using information theory for working out an appropriate match between the learner and the instructional stimulus. The pursuit of such a match is prompted by the general scientific axiom that physical events have physical causes. Information theory applies this axiom to those events in which selection becomes a key operation. Selection involves locating the elements in a given situation that will contribute to some definable goal. In the case of the Taxonomy, the goal is characterized in terms of engagement, the validity of which has yet to be substantiated.

If the notion of engagement is eventually verified as a useful one in describing the operational goal of the Taxonomy, then the task of facilitating attainment of that goal is a difficult one indeed. What makes it so difficult is that there are so many alternative ways of working toward it and so few that stand a chance of success. Consequently, in line with Ashby's (1963) "law of requisite variety," if the total possible universe of ways of packaging and administering instructional content in a subject area is X, and if the sample that can facilitate a desired period of engagement at a given time is Z, then some body of principles and information is needed to exercise control so that all other than the Z choices are eliminated. Whatever exercises such control is said to be processing information in the area designated by Z which contains a quantity of alternatives.

While not an instrument for processing information, the Taxonomy can contribute to decision-making and provide classificatory labels for the choices that fit. It is suspected that those teachers who are the quickest to make decisions about what they consider to be appropriate content and strategy are the extremely competent and the extremely incompetent, the former because they process information about a great many alternatives so rapidly, and the latter because they are ignorant of most alternatives and relatively stereotyped in their approach to instruction. One may also speculate that the greater the pupil's handicap, the greater is the need for the teacher to know and exercise his Taxonomic options. The reason for this is that for the more severely handicapped there are fewer such options. Under such circumstances, there is greater likelihood that the teacher's repertoire will tend to be restricted unless he has a clear understanding of all the possible ways he can perform his instructional tasks.

Taxonomic Instruction and Prescriptive Teaching

The Taxonomy may be regarded as still another addition to the growing number of paradigms for prescriptive teaching. There are indeed areas of overlap with other such schemes, but it is also important to know where they diverge. For the instructional processes, the emphasis generally is on detailed and sophisticated diagnostic procedures and analyses of learning tasks in order to tailor-make the problem-solving steps for each learner. In his discussion of ways to translate diagnostic findings into what he calls teaching methods, Peter (1965) leans heavily in the direction of organizing content in appropriate formats and sequences in adapting to individual learning needs. Smith (1968) formulates his principles of instruction in terms of what he calls "the systematic and sequential development of skills leading to conceptual understanding and not rote memo-

rization." He also notes such considerations as motivation, reinforcement, overlearning, and stress on accuracy. Still another plan (Bush and Giles, 1969) contributes detailed prescriptions for the cultivation of decoding and encoding processes at the various levels or organization suggested in the psycholinguistic language model.

The scope of the Taxonomy might be characterized as more restricted with respect to teacher roles and more expansive in instructional behaviors than most prescriptive teaching programs. Whereas others often take into account the total school environment of the handicapped child, physical arrangement, collaborative services, the reward and punishment system, and instructional equipment, the Taxonomy has no direct concern with such matters. Instead, its intent is to add new dimensions to diagnosis of learning styles in the classroom, decision making in instructional planning, training for competence in instruction, and the design and classification of instructional aids. To accomplish this, it introduces two major innovations: The first has to do with the systematic consideration of instructional modes and methods, and the second has to do with the interactive impact of the several domains of the Taxonomy on learning and behavior.

APPLICATIONS OF THE TAXONOMY

Since the initiation of the Taxonomic Instruction Project in 1966, the project staff has been housed successively in two cooperating "600" schools and has concentrated on training the schools' staffs to translate the scheme into classroom reality. Fortunately, the school administrators cooperated not only by encouraging the teachers to accept the proffered training but also by making space and facilities available to the project staff. Without the active good will of the administrators the project could not have gotten off the ground. However, training for a new approach to instruction was understandably difficult for some teachers, especially those who had developed their own classroom style over the years and were uncomfortable in habituating new possibilities. It was therefore necessary to adjust the tactics of orientation and training to the teachers' individualized styles and levels of readiness for this kind of innovation. In some instances, members of the project staff themselves had to prove that the system works in a classroom situation before the teachers would be willing to accept training. There was also a period of time when teachers associated the Taxonomy strictly with its resource library at the school, regarding it as an instructional materials pharmacy with prescriptions filled (and often written) by the project staff. It took some time before all cooperating teachers recognized other ramifications of the project as intended in the original and evolving plans. For the most part, there was never much serious question about the teachers' willingness to collaborate; it is just that the essence of the Taxonomy had to be packaged and presented in different ways for varying lengths of time to them. As it embedded itself more and more into the life of the school, there emerged a number of possible applications ranging from diagnostic procedures to avenues of research and teacher training.

Diagnosis

The first version of the Taxonomy has been developed for a pupil population suffering from a long history of educational failure, with all the attendant hostility toward school and low self-estimates. The pupils had neither built a productive learning relationship with teachers nor had they ever seen the educational milieu as an environment in which they showed to best advantage. As a first step, therefore, toward establishing some positive identification between them and the school world, the project staff initiated a diagnostic program as a means of probing for cognitive strength. For each pupil, there was a record of learned and nearly learned skills, and this material was utilized as instructional content filtered through various strate-

gies of the program. In other words, children were being taught what they already knew, but in different ways, so that for a period of time they could not fail.

Diagnosis is not restricted to a clarification of what the pupil knows; it also involves careful monitoring of how he behaves in the test situation. Note is taken of the sensory modalities he prefers to use in sending and receiving messages, the instructional modes that are most likely to arouse his attention and sustain it for the longest period of time, and the social setting in which there is the least amount of learning inhibition for him. To be sure, the face validity of these behavioral criteria requires empirical testing. It is by no means certain that a pupil's receptivity to particular instructional strategies reveals much more than the habits he formed and his ease with the familiar. Sighted individuals, for example, prefer to read novels rather than listen to them, but is this preference necessarily a guarantee of better comprehension and recall of details? Or does it merely denote the person's customary behavior which may therefore be most comfortable for him, but which actually or potentially is not the most efficient way to help him obtain his goal? These are fundamental questions that have to be answered before any taxonomy can be justified as a basic framework for diagnostic procedure.

The principle of delineating and fixating temporarily on areas of cognitive mastery rather than concentrating initially on the problems of deficit grows out of Feuerstein's (1968) approach to diagnosis in his Learning Potential Assessment Device. Working primarily with socially disadvantaged, educationally retarded adolescents, Feuerstein rejects the notion that the status of the handicapped child's dysfunction — which most diagnostic programs are aimed at revealing — is a valid index of his capabilities under mediated learning conditions. Measurement technique is in essence a search for cognitive strength that is underutilized because of inadequacies in what some psychologists (DeCecco, 1968) call "entering behavior" in problem solving situations. The child's intellective status is therefore less important than the extent of its modifiability, the amount of teaching investment necessary to bring about improved performance, and the transferability of newly acquired meta-learning habits to new tasks. Blockages of optimum functioning occur at the receptive and expressive levels, or at the intermediate level of cognitive integration. In psycholinguistic terms, the child needs help framing and focusing on the essential demands of a cognitive task so that he could demonstrate his facility for encoding, decoding, and making the necessary cognitive associations. Testing for modifiability, then, is not just a probe of how *well* the child performs but also how he performs *stylistically*. The idea is to help the child extinguish the inhibitive styles and cultivate those that are more facilitating as he undergoes a long series of systematically controlled problem solving exercises. This process of observing the child's responsiveness to stimuli as a basis for mediated learning has been adopted as an essential tactic for diagnosis in Taxonomic Instruction.

Research

A paradigm such as the Taxonomy requires intensive testing of its fundamental hypotheses. First and foremost is the question of whether each child is unique and consistent in his preferences of instructional strategies. That is to say, do these preferences revolve around distinguishable stylistic factors that consist of several alternatives that logically go together? Or is the child so situation-bound and novelty-oriented that it is useless to search for internal consistency for any reasonable period of time? With some behaviorally disordered children there is the added problem of perseverative response patterns that either yield no special preference for any stimulus strategies, or preference which is locked into an unusually sparse

variety of stimuli. Such questions lend themselves to factor analytic study that reveals if and how strategy preferences cluster themselves for different kinds of handicapped populations.

Closely related to the study of strategy preferences is the analysis of under-the-skin learning characteristics that correlate with the preferences. The teacher needs a great deal of information about the child that is relevant to his decisions regarding plans for Taxonomic Instruction. If he cannot get the information, the result can be inefficiency in the scanning and heavy reliance on trial and error and superficial observation. Knowledge of the kinds of children who tend to be most responsive to certain kinds of instructional stimuli would contribute to more educated guesswork, especially during the early planning periods. There is need to accumulate data on personality variables that go together with each strategy in the four categories and each combination of strategies across these categories. The associations may vary with different sequences and formats, so that too merits investigation.

Another research concern of the Taxonomy is the validation of engagement as a practical criterion variable. Since the term is used in its superficial sense, it is a moot question as to whether the observable signs of engagement relate to learning and behavior. It could signify attention both to the essential and inessential elements of the stimulus, and without proper mediated differentiation between the two, simple engagement may be an inadequate barometer of learning success. That is, it may qualify as necessary but not both necessary and sufficient. The test will come as data are collected on the relationship between progress in achievement and cumulative lengths of engagement over a specified period of time, with proper controls established for a variety of independent variables. These would include initial levels of pupil functioning, variations in classroom environments, differences in reinforcement systems, and the extent of out-of-school supportiveness for learning. Similar evaluations would be made of engagement as an index of behavior regulation in the classroom.

Validation of the Taxonomy will also have to be tested in terms of its utility for helping to define teacher competence. Are highly rated teachers distinguishable from their mediocre colleagues by virtue of the strategies they employ? Are the strategy patterns distinguishable in range, variety, and novelty? Is it possible to construct meaningful teacher habit profiles with the help of the Taxonomy? Experience in the use of the model demonstrates how graphically it can depict the extent of flexibility in teaching behavior. For example, in Figure 7, there is a series of four code numbers depicting the instructional plans of one teacher for a period of several hours. It is noteworthy that the fourth digit, referring to instructional method, is always 1, which means that the teacher spent the whole time working with the total group. There may be good reason for this single way of grouping throughout, but the question is whether the teacher arrived at this decision after contemplating the alternatives, feeling comfortable in employing any of them, and deciding to stay with this approach exclusively. With his behavior thus mirrored, the teacher can constantly reflect on his planning and introduce variations systematically.

Teacher Training

The most important use of the Taxonomy has been as a tool for lesson planning. Teacher training in the use of the model is therefore essential, and this involves three, possibly four competencies. First, the teacher has to know the range of behavioral alternatives indexed in the Taxonomy. Second, he has to practice acting out these behaviors until he becomes equally comfortable with all of them, so that the choice among them is dictated by what he knows about the child rather than what has been customary and habitual for him heretofore. Third, with the help of research-based insights into the relationship between personal characteristics and strategy preferences among pupils, reinforced by his own diagnosis

Figure 7

Sample Teaching Sequence

I Basic Skills	II Subskills	III Sequences Levels	IV Inst. Methods	V Inst. Modes	VI Comm. Input	VII Comm. Output
1	1	2	1	3	2	2
2	4	1	1	4	4	3
3	3	2	1	9	4	4
2	2	1	1	2	2	3

of pupil reactions to content and strategy, he must learn to effect a goodness of fit between learner and task. Finally, to the extent that circumstances force him to be self-reliant in the location, adaptation, and creation of instructional materials to actualize his designated strategies, he must learn how to be his own resource person and librarian.

Familiarity with the meanings and uses of the Taxonomic model require study and practice of behaviors that are easily defined. This aspect of training might be aided by a library of video tape vignettes depicting all possible seven digit code combinations of categorized content and strategy. Such a library would lend itself to cross-indexing so that if, for example, a teacher-in-training wants to see how puzzle-play activities are enacted with various kinds of content, using different sensory modalities, and in all grouping combinations, he could retrieve the tapes easily by retrieving all tapes coded number 3 in the fifth digit (i.e., Instructional Modes).

In contrast to the relative ease with which the Taxonomy can be learned, it takes more knowledge than is currently available to apply it. Perhaps definitive understanding will forever be elusive, and teachers will have to rely first on trial and error that leads to more and more educated guess-work as they become increasingly proficient in information processing. It may even be possible to reach the point where a good deal could be said about how a pupil is likely to respond to different instructional strategies, and with what effects, but with relatively little understanding of why he responds the way he does. In that case, the Taxonomy might join the typical highly valid but modestly reliable test instruments in being likened to an axe designed to chop down a tree: If it does the job successfully, nobody cares terribly much about the composition of the metal alloys in its blade.

Ideally, research will help formulate enough criteria by which to make reasonable, if not infallible judgments about the way teachers should make decisions in planning instruction. When that time comes, teacher training will be strengthened considerably through computer assistance. One appropriate training model might be comparable to those used with student physicians in applied medicine. The trainee is given some information about the background

and habits of a hypothetical patient (pupil, in the case of the teacher) and is asked whether he is ready to make a diagnosis on the basis of what he already knows. If his answer is positive, he prepares his prescription and justifies his choice of ingredients on the basis of his diagnosis. If, on the other hand, he elects to defer judgment, he is invited to specify the kinds of additional information he needs before deciding on the remedy. It is hoped that the seven categories of the Taxonomy constitute the appropriate pools from which to draw the ingredients for the most therapeutic instructional treatments.

Creating an Instructional Materials Library

Traditionally, libraries of instructional materials have been organized mainly around subject matter areas catalogued according to sequence levels and occasionally around format. Relatively little attention has been focused on designing and indexing instructional aids also in terms of the strategies with which they could be used. Early in its work, the Taxonomy project staff surveyed a large sampling of remedial reading programs and ascribed the appropriate Taxonomic code numbers to them. Results showed that while some code numbers were frequently represented, perhaps even over-represented, others did not appear at all. The Taxonomy coding system can serve as a guide for filling in gaps in material design in order to make the library more balanced and abundant. The code could also be used as the indexing system for the library to facilitate retrieval of instructional aids. With the help of a computer, a teacher simply punches out a seven-digit number indicating the kinds of materials he needs and the instant response is a listing of the specific items that fit his stated requirements. Some teachers may feel uncomfortable with what seems to be a mechanical, push-button way of preparing for instruction, with the child somehow lost in the legerdemain. However, in reality, instruction is humanized rather than mechanized since every one of the seven decisions has to be justified in terms of what the teacher knows about the child, not by his facility in manipulating a code system. To the extent that his own behavioral idiosyncrasies no longer influence his instructional planning as they once did, he does surrender some of his individuality. But this is a sign of deference to the child, not the machine.

For the curriculum designer whose job it is to stock the materials library, the Taxonomy offers real possibilities for step-by-step training. At the beginning stage, the trainee is asked to describe the existing teaching aids in his library in terms of the seven-digit code number. At the next stage he is asked to redesign some material to fit a specified change in one of the digits. This is followed by exercises in brain-storming, in which he is required to take an instructional aid and make as many changes in its Taxonomic code as he can imagine and to restate the instructions to teachers accordingly. Finally, he is presented with a seven-digit code number and asked to design instructional materials to fit that order. Such training is useful not only for those whose job it is to write materials but for classroom teachers as well.

Classroom Supervision

A supervisor's observation of classroom teachers is sometimes referred to as "snoopervision" unless it is aimed at teacher-training. The Taxonomy Class Observation Form (Figure 8) can also be used for either purpose. It is a simple instrument in which the columns are labeled with people's names while the rows represent two-minute intervals. The observer's task is to monitor each pupil's activities during every two minutes. (Experience has demonstrated that this can be done without difficulty.) The form in Figure 8 is a ten-by-fifteen grid which could be used when observing a group of ten children for a period of thirty minutes. On the left of the grid is a listing of seven-digit numbers describing the group's activities during that thirty minute period, assuming that the thirty minutes were intended to be filled with instruction. For simplicity's sake, a one-digit code number has been placed in the

box to the left of each Taxonomy code number, so that [1] represents 2128423, [2] represents 3135542, etc. Thus, pupil A was engaged in activity [2] (3135542) for sixteen minutes of the period and then became engaged in [3] (3421944). Pupil B was engaged in activity [1] (2128423) for six minutes and was disengaged (represented by the letter D) for the rest of the time. Maximum allowable time for transition (represented by the T) from one activity to another is four minutes.

The first (and lesser important) use of the observation form is to obtain an index of engagement which simply denotes how much of the period has been taken up with instruction. This is done by calculating the proportion of cells in the grid that are filled with numbers and T's. Periodic samplings of these indices can serve some purpose in revealing trends over the school semester or a specified period of experimentation. A more meaningful use of the form is to reflect back to the teacher some vital information about engagement patterns of individual pupils. For example, pupil B became disengaged after six minutes and never reconnected

Figure 8

Class Observation Form

[1] 2128423

[2] 3135542

[3] 3421944

A	B	C	D	E	F	G	H	I	J
2	1	1	1	2	2	D	1	2	1
2	1	1	1	2	2	D	1	2	1
2	1	1	1	2	2	D	1	D	1
2	D	1	1	2	2	D	1	D	1
2	D	1	1	D	2	D	1	D	1
2	D	1	1	D	2	2	1	2	1
2	D	1	T	D	2	2	1	2	1
2	D	1	T	D	2	2	1	2	T
3	D	3	3	D	3	3	3	3	3
3	D	3	3	D	3	3	3	3	3
3	D	3	3	3	3	D	3	3	3
3	D	3	D	3	3	D	3	3	3
3	D	3	D	3	3	D	D	3	3
3	D	3	D	3	3	3	D	3	3
3	D	3	D	3	3	3	D	3	3

2 minute intervals

D=Disengaged
T=Transition

himself with any instructional stimuli. This information could be used to dissect the Taxonomic plan for him and to speculate on which of the seven categories of planning might have failed. In other words, it is a way of providing constant feedback on pupil's responsiveness, information that has to be processed in order to reach the core of content and strategy options that are best suited to each pupil.

Inter-judge reliability has thus far been high for the instrument, although there are times when an observed strategy or bit of content is coded differently by various observers. This is usually ironed out by defining more precisely and reaching agreement on the meaning of the particular code numbers in question. There are also times when the Taxonomic code number recorded by the observer is not identical to that which was planned by the teacher. Here too, it sometimes represents a difference in opinion as to how the particular activity should be categorized. More often it means that the teacher has changed his plan at the moment of instruction for reasons he can or cannot justify.

Evaluation

Any experimental program that is broad enough to have multiple objectives is difficult to evaluate for many reasons, not the least of which is the danger of intervening variables contaminating the outcomes. Selective factors can always intrude when groups of children and teachers are divided into experimental and control situations. Then, too, there are always the imponderables of school climate, home environment, and teacher behaviors outside the realm of instruction that affect the ultimate results. And finally, how does one control the halo effect in an experimental situation which requires intensive teacher training and more than occasional classroom demonstrations? But without minimizing the gravity of methodological problems, it is possible at least to suggest some criteria measures that could be addressed to the basic objectives of the Taxonomy. They include the following:

1. Achievement in basic skills as measured by the usual standardized tests in pre-post-comparisons with experimental controls.

2. Growth in engagement, provided it proves to be a valid criterion variable.

3. Changes in the pupil's classroom habits, defined here as relationships with classmates and teachers, participation in school work, response to crisis situations, exercise of self-discipline, and other aspects of behavior at school. In collaboration with Dr. Samuel Levine of San Francisco State College, this author has drafted a rating scale that will eventually figure in the evaluation after it is refined and validated. (See Appendix A)

4. Changes in pupil self-image as measured by a Bills-type instrument that probes the pupil's current self-estimate and his aspirations, and the differences between the two in terms of various aspects of temperament, social traits, and educational functioning.

5. Changes in pupil attitudes towards school. Methodologically, this is a replication of a study by Flanders and associates (1968) which noted changes in teacher attractiveness, fairness of rewards and punishments, teacher competence, and interest in school work over the school year in relation to the extent to which teachers provided praise and encouragement in working with pupils. The expectation here is that just as there were positive changes associated with the teacher's success in providing supportiveness, hopefully there will also be positive changes associated with the teacher's success in effecting engagement.

6. Changes in classroom climate, which will be determined by measures of disruptiveness, task orientation, interpersonal relations, and general rapport between teachers and pupils.

7. Changes in the teacher's instructional repertoire growing out of his experience with the Taxonomy over a reasonable period of time. No hypotheses are suggested as to the nature of these changes.

8. Parents' ratings of changes in their aspirations for their children, resulting from personalization of instruction which may enable pupils to work productively within the home environment.

IN CONCLUSION

The research team that has been working on the Taxonomy has set as its long-range goal some meaningful contributions toward a science of special teaching. This involves systematic analysis of teaching-learning processes which will, hopefully, produce a clearer delineation of the teacher's role in working with deviant children and some empirically based principles of effective teaching behavior. The teacher is perceived as (1) a socializing agent operating in the interpersonal affective domain; (2) a cultivator of complex intellective coping mechanisms; (3) an orchestrator of reward systems for effective behavior guidance; and (4) a purveyor of the tools of learning. In each of these tasks, the teacher is an actor who requires not only the sensitivities of an artist engaged in performance; he also requires profound scientific acumen for a thorough understanding of his craft. Specifically, he has to understand the psychic wiring system of the pupil as receiver and transmitter of messages. He should clarify his own wiring system as the communicative interactor with his pupils. And finally, he needs to clarify the structure of the message and the nature of the atmospheric conditions which filter messages between transmitter and receiver.

There is a great deal of empirical work to be done before significant principles can evolve concerning the various aspects of a science of special teaching. The hope is that the Taxonomy provides a basis for step-by-step research efforts that will ultimately contribute to improved instruction for handicapped children.

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APPENDIX A

Levine-Tannenbaum Classroom Participation Scale
(Experimental Draft)

Child's Name _____ Teacher _____

Age _____ Sex _____ Date _____
Years & Months

Child Description: Please place an "X" on the line in front of the words that **best** describe the child being rated.
Please place a " √ " on the line in front of the words that **least** describe the child being rated.

_____ Boisterous	_____ Hypersensitive	_____ Restless
_____ Depressed	_____ Inattentive	_____ Self-Conscious
_____ Disobedient	_____ Irresponsible	_____ Tense
_____ Disruptive	_____ Lethargic	_____ Volatile
_____ Hyperactive	_____ Resistive	_____ Withdrawn

Direction: For each item, place an "X" on the line under the frequency which most characterizes the pupil's behavior.
If you do not have enough information to form a judgment, place an "X" on the "No Opinion" line

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
1. **Starting work under supervision:** Under the teacher's direction, he begins an assignment without resistance or distraction.	_____	_____	_____	_____	_____
2. **Starting work independently:** When he is given a familiar or routine assignment that he is able to carry out, he will initiate the assignment without further direction.	_____	_____	_____	_____	_____

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
3. **Finishing work independently:** Once he gets started on assigned **independent** work, he will complete it without resistance or distraction.					
4. **Finishing work under supervision:** Once he gets started on assigned **supervised** work, he will complete it without resistance or distraction.					
5. **Disruptive behavior:** When there is disruptive behavior in the classroom, he is in the "thick of it."					
6. **Out of school behavior:** Has a reputation for getting into trouble away from school.					
7. **Need for incentives:** He will engage in instructional activities without the need of external rewards (e.g., prizes, privileges, etc.)					
8. **Transition between activities:** In changing from one activity to another, he requires direct and immediate supervision (i.e., by an adult or companion).					
9. **Accepting behavior limits:** When the teacher sets limits on his behavior, he accepts the limits (e.g., restricts his movement within the room, the use of materials, or the type of activity).					

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
10. **Jealousy:** Wants what other children have, including privileges or possessions.					
11. **Changes in routine:** He accepts changes in familiar routine without resistance or disruption (e.g., changes in room arrangement, activity, schedule, or teacher).					
12. **Reaction to criticism:** He evidences exaggerated responses to teacher's suggestions (i.e., explodes in anger, sulks or shows indifference).					
13. **Seeking help from the teacher:** He makes effective use of teacher's assistance (i.e., he neither asks for more or less help than he seems to need).					
14. **Relationships with classmates:** He is successful in forming friendships with a large number of his classmates.					
15. **Working with classmates:** When other students seek his involvement in assigned or approved classroom activities, and the situation permits his participation, he participates.					

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
16. **Interacting with classmates:** When interacting with other students in class, he uses aggressive physical contact (e.g., pulls, pushes, hits) or loud, harsh, verbal interchange (e.g., yells, swears).					
17. *Taking Turns:* In an activity which requires him to take turns, he attempts to get ahead of the other student.					
18. ***Sharing materials:*** When asked, he shares materials and equipment.					
19. **Helping Others:** When another student near him is having difficulty in using *materials and equipment*, he volunteers to help him.					
20. **Accepting help from other children:** When he is having difficulty in an activity and one of his peers offers to help, he accepts the help.					
21. **Reaction to frustration:** When he does not get what he wants or things are not going well, he becomes disruptive or sulks.					
22. **Borrowing:** When he wishes to use another's material he asks permission.					

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
23. **Pride in his work:** After successfully producing a tangible piece of schoolwork he is proud enough to treasure it for a while.					
24. **Returning Property:** When he has borrowed something, he can be counted on to return the property to its owner without being reminded.					
25. **Care of materials:** He can be relied on to use materials and equipment without damaging or wasting them deliberately.					
26. **Using materials safely:** When using materials and equipment, he does so with regard to the safety of others near him (e.g., doesn't swing materials through air or tip over equipment).					
27. **Seeking attention:** Seems to work hard at calling attention to himself in the classroom.					
28. **Persistence:** He is persistent in trying to solve problems that seem within his ability to solve.					
29. **Response to competition:** He is able to engage in activities having reasonable degree of competition without becoming unduly upset (i.e., sulking, lashing out, or breaking up activity).					

	Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
30. **Reaction to leadership of others:** When involved in a group activity led by a peer, he can accept a subordinate role.					
31. **Assuming leadership roles:** He can accept leadership responsibilities in a small group.					
32. **Reaction to classroom performance:** He is indifferent to whether he succeeds or fails as a student.					
33. **Deportment in class:** His classroom behavior can be described as self-controlled (i.e., he is not disruptive or disobedient).					
34. **Behavior in public places:** When taken to public places with a group, he evidences exaggerated behavior (i.e., showing off, unnecessary shoving or yelling, or fearfulness).					
35. **Relating socially to his teacher:** Makes an effort to get friendly toward his teacher during recess or after school.					
36. **Truthfulness:** Can be trusted to tell the truth even under somewhat embarrassing circumstances.					
37. **Deviousness:** Will use sly, crafty means to outwit people or to get what he wants.					

		Nearly Always	Frequently	Occasionally	Hardly Ever	No Opinion
38	**Fulfilling Responsibility:** Can be counted on to do a job as well as he is able to do it, once he assumes the responsibility.					
39.	**Physical appearance:** Is concerned about his grooming and will attempt to dress in accordance with his own best taste.					
40.	**General likeability:** The kind of pupil a teacher enjoys having in class.					