RESEARCH ON THE RELATIONSHIPS BETWEEN GOALS OF EARLY CHILDHOOD PROGRAMS, ALTERNATIVE TEACHING PROCEDURES, AND COGNITIVE AND BEHAVIORAL OUTCOMES

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In recent years, the point has been made that families should be provided with educational options as a means of providing a productive and high quality educational system. While educational diversity is a worthwhile goal, the suggestion that it can in itself contribute to the solution of educational problems is based on rather tenuous assumptions. One assumption is that parents differ widely in their educational goals. I would suggest that families do not have really divergent goals and that, although the emphases may vary, most are interested in a range of developmental areas. They want their children to learn basic skills, to think well, to succeed in later life, to like school, and to develop well in socio-emotional areas. The divergence in parental views about education is based not primarily on goals, but rather on the best environment for attaining these goals. Thus, some families believe their children's development can best be enhanced by traditional academic procedures, while others feel that an open school structure is more useful.

A second assumption is that parents have or can be provided data to make informed choices between alternatives. I suggest that, for the most part, these data do not exist. Parents (as well as schools) have to make choices between educational procedures

with little information as to the effects of these procedures on different areas of child development. Nonetheless, some recent research efforts have indicated that it is feasible to design studies that can eventually provide this kind of information. Until data are available, diversity and choice per se will have only limited value to parents who cannot reasonably predict the consequences of their selections.

After more than ten years of intensive research on early childhood programs, results are beginning to emerge which indicate that certain programs are more successful than others in achieving particular goals. These results are based on a small proportion of the research that has been conducted. Most studies were designed to determine whether a class of programs (e.g., Head Start) had long-term effects on IQ and achievement test scores, and were not designed either to compare different programs or to explore relationships between specific program design variables and outcomes. However, results of a few recent studies provide some evidence of differential program effects and indicate that optimum classroom procedures might vary according to the goals of the program. That is, the procedure of choice might be different for teaching basic skills of reading and math than it is for teaching abstract thinking. The results that exist are tentative, but there is enough consistency across studies to suggest the value of developing further more carefully controlled research to test specific hypotheses.

The purpose of this paper is to review results of research on selected preschool and early elementary school programs, and to suggest implications of these findings for the design of future studies. Both methodological and substantive issues are considered in the review. The paper focuses on children from three to eight, and includes issues specifically related to children from low-income families, as well as issues of more general educational concern. Section I sets forth the generally accepted goals of early childhood programs and summarizes typical measures and research designs in order to provide a framework for the discussion that follows. Section II describes research findings and suggests hypotheses for further research based on these findings. Section III outlines a procedure for developing this research.

I. GOALS, MEASURES, RESEARCH DESIGN

A. Goals

It may be useful, by way of introduction, to summarize the generally accepted goals of early education programs. While programs may differ with respect to the relative emphasis given to each, and certain goals may not explicitly be stated, most programs are designed to accomplish one or more of the following goals:

1. Achievement goals. Programs typically include detailed curricula in specified subject matter areas, e.g. language, alphabet, numbers, etc., that are precursors for the development of more complex skills. The programs are designed to teach facts, and are not designed to teach strategies that transfer to different learning requirements. This type of approach is exemplified by Bereiter and Engelmann's work with disadvantaged children (1966).

2. Cognitive goals. The aim is to enhance cognitive development in areas of "intelligence," conceptualization, problem solving, reasoning or divergent thinking. The achievement of these goals is assumed to be directly related to a subsequent ability to handle complex learning tasks. The purpose of the program is to provide learning strategies which children can use in a wide variety of learning situations. Sprigle's Learning to Learn Program (Van De Riet and Resnick, 1973) is an example of a model emphasizing general cognitive development.

3. Socio-emotional goals. Included in this category is a broad range of diverse objectives, e.g., the child's "happiness," satisfaction in the program, independence, initiative, motivation, affective development, peer relationships, etc. Although these behaviors are considered to be important objectives in themselves, they are also frequently assumed to be related to cognitive development. That is, a program that enhances a child's self-

concept or motivation might also, indirectly, improve academic performance. The Bank Street Model (Clark and Rippy, 1970), for example, is based on socio-emotional goals.

4. Anti-poverty goal. This goal was the primary rationale for many early childhood program and research efforts in the last ten years (e.g., the Westinghouse Head Start Study, 1969). It is based on the hypothesis that programs could provide compensatory experiences and skills which would enable low-income children to compete more effectively with middle-class children in subsequent schooling and careers. The goal directly affected the selection of criteria by which to evaluate program effectiveness. Thus, in order to demonstrate that programs had anti-poverty potential, it was necessary to demonstrate first that they produced long-term cognitive effects.

5. Indirect program objectives. These include potential effects of educational programs which are not directly related to classroom procedures; e.g., the effect of the program on health (by providing screening or referral services), family relationships, community action and participation, employment of paraprofessionals, etc.

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This paper focuses upon the relationship between environmental variables and the behavioral and cognitive development of children. Therefore, the discussion will be limited to the first three goals. The anti-poverty goal is not included as a research issue because

the long-term relationships between program design and child development, as well as the relationship between abilities and access to employment, would require a research design and methodological sophistication beyond our present capacities. The more indirect objectives such as improved health, community participation, and employment of paraprofessionals are also excluded from this discussion. These goals are not directly related to formal educational procedures and therefore require for their study quite different research designs. For example, research on the relationship between early childhood programs and paraprofessional employment has little to do with optimal program design but rather requires an approach which considers such questions as community employment patterns and income distribution.

B. Measures

Although most early childhood programs are directed toward a range of behavioral goals, measures to assess the effects of these programs are extremely limited. This section provides a brief summary of the developmental areas for which measures are available, and the areas in which there are significant gaps.

1. Standardized tests. Achievement tests are designed to assess knowledge of a specific curriculum. They include both norm-referenced and criterion-referenced tests; the former are designed to compare children's performance with that of their peers, the latter to evaluate mastery of particular subject matter areas. The

design and standardization of achievement tests are relatively straight-forward and the tests can be applied to assess a program's ability to teach particular information, such as letters or numbers (e.g., the Metropolitan Achievement Test). One major limitation of these tests, however, is that they do not predict children's performance in areas not specifically measured by the test.

Tests of general cognitive ability, in contrast, are designed to assess intellectual competencies which transfer across tasks, e.g., tests measuring abilities to solve problems, "reason", conceptualize, etc. There have been some successes in constructing norm - or criterion-referenced tests in this area--e.g., the Stanford-Binet, Raven's Progressive Matrix Test, or tests specifically designed to assess results of abstract cognitive curricula (Blank, 1973). However, most cognitive abilities are not adequately measured because the objective manifestations of these abilities have not been clearly identified.

Numerous tests of socio-emotional development (e.g., The Brown IDS Self-Concept Referents Test) have been designed for young children; however, these tests have provided little useful information. In some respects, problems are similar to those encountered in developing general cognitive tests. It is difficult, for example, to describe operationally self-concept or motivation because the behaviors defining these constructs have not been specified. It is likely too, that even if consistent behaviors

were specified for different contexts, they could not be successfully measured by a paper and pencil test. In short, programs which address socio-emotional goals have not to date been effectively evaluated.

2. Behavioral observations. A number of observation scales are available for assessing the classroom environment (e.g., teacher-child interactions) and for measuring child behavior. Typically, observers rate teachers' and students' behavior according to a set of predetermined categories, either from direct classroom observation or by use of videotape. The measures vary in the degree of inference required by the observer, depending on the objectivity of the categories to be coded. They also vary in their generality; i.e., certain scales are designed to measure a range of classroom behaviors while others are designed to measure a set of behaviors hypothesized to comprise a single trait, such as competence. Frequently, results of scales are factor analyzed to derive clusters of behaviors which can then be related either to other observed behaviors or to standard test scores.

Observational techniques pose difficulties both in administration and analysis. Behavior is difficult to categorize, reliability is often low, and analysis is tedious and frequently produces uninterpretable results. Moreover, few scales have been either standardized or validated through demonstrated relationships with other observational or standard measures. Despite these difficulties, behavioral observations appear to be a potentially useful method for measuring socio-emotional behaviors, particularly

in young children. They are also essential for assessing program environment and can be a useful technique for measuring general cognitive abilities. The use of behavioral observations in standard situations, where environmental variables are held constant, as contrasted with naturalistic situations (e.g. classroom or home), can also provide a useful assessment procedure.

C. Design

Three approaches to designing research to evaluate early childhood programs are described below. These designs have been used both independently and in combination.[1]

1. Comparison of programs and control groups. Under this design, children participating in experimental programs are compared with either home controls or with children in traditional programs. Head Start evaluations typically have used this model (for a summary of these studies, see Stearns, 1971). The design does not provide information as to the environmental variables differentiating the experimental and control groups. If the groups differ on outcome measures, no data are available on which

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[1]Each of these procedures can be applied to existing programs or can be implemented using programs designed specifically to meet particular criteria and goals. Further, subjects can be assigned randomly to programs or they can be self-selected. Natural settings generally refer to studies in which existing programs with self-selected subjects are used, while experimental settings refer to programs at least partially under the control of the researcher, to which subjects are randomly assigned. The advantages and disadvantages of natural vs. experimental studies are beyond the scope of this discussion. It may be observed, however, that in practice the differences between them are frequently unclear. Even the most carefully planned experimental programs using randomly assigned children are subject to a variety of uncontrolled variables (e.g., differential attrition rates, unanticipated changes in curricula, etc.) which affect the outcome of the study.

to base an interpretation of these differences, nor do the results suggest procedures for subsequent program design. Similarly, if no differences are found, little has been learned that can be applied to the design of the next study.

2. Comparison of alternative programs. In these studies (e.g. Head Start Planned Variation and Follow Through), comparisons are made between different types of experimental programs, as well as between experimental and control programs. The programs are selected to represent alternative educational goals and learning procedures. A typical comparison is between academic programs using contingent reinforcement procedures and programs with general socio-emotional and cognitive goals in which children are permitted wide freedom of choice. Since the programs, by necessity, vary along a number of dimensions, it is not possible by simply comparing them to determine the particular classroom variables which account for differences in outcome measures. The procedure, however, has produced more research information than a design which compares program participants with control children, since differences in outcome measures often provide data on which to base hypotheses for future study.

3. Comparison of environmental variables. Under this design, variables within programs which directly affect children are identified and related to outcome measures. The aim is to describe teaching methods and teacher-child interactions, and to relate these classroom processes either to observed child behaviors

or to standardized test results. The basic comparison, therefore, is between classroom procedures (e.g., individualized vs. group instruction) rather than between programs. This type of analysis has been used in conjunction with the Planned Variation and Follow Through studies where an attempt has been made to identify, through behavioral observations, the variables that differentiate the programs and impinge directly on the child. The approach has had only limited results both because of existing problems in measurement techniques and a paucity of theoretically-derived hypotheses relating program components to child outcome measures. Further development of research designed to identify these relationships is needed, however, if studies are to provide guidelines for planning future programs.

II. RESEARCH RESULTS

As described above, most evaluations of early childhood programs have compared a "mixed bag" of programs (the experimental groups) in which treatment variables were not identified, with programs or homes (the control groups) where environmental variables were also unknown. Comparisons between groups were based primarily on IQ and achievement test scores. The typical finding was that children in the experimental groups achieved short-term test score gains, but that differences between experimental and control children were no longer evident when both groups were in ordinary school settings. With the

exception of this finding, these studies have produced almost no other research information which would be useful in interpretation or in designing future programs, nor have the studies added to knowledge of the learning process or suggested hypotheses for further research.

However, a few recent research efforts have been designed to assess classroom procedures and children's behavior more systematically. Results of these studies suggest useful hypotheses for further research. These findings and possible interpretations are described below. Research findings are discussed which provide information as to possible relationships between classroom procedures and child outcomes. In particular, the Head Start Planned Variation and Follow Through studies are included in some detail because their design permits a more sensitive analysis of classroom variables than has been possible in most other research.

A. Achievement Goals

Preschool and early elementary school studies indicate that clearly identified achievement goals can be reached most effectively when (a) academic goals are specified for teachers and students, (b) a detailed sequential curriculum is presented to students, and (c) the instruction is individualized[1] using drill, child response, and contingent reinforcement. Although there are exceptions, this

[1]In the context of this paper, individualized instruction refers to teaching procedures in which each child is given a curriculum sequence (either by tutoring, small group instruction, or programmed instruction) designed to meet his particular needs.

classroom procedure appears to have been most successful in teaching specific skills and facts. There is no evidence, however, that the learning transfers to other tasks when the teaching methods are discontinued.[1] These conclusions are based on reviews of preschool and elementary school studies by Stearns (1971), Bronfenbrenner (1972), and White (1972), and on research summarized below.

Results of the Head Start Planned Variation Study, Year Two (Smith, 1973), indicate that programs planned to emphasize academic drill, individualization, and systematic reinforcement also demonstrated high achievement test scores. The three Planned Variation models with specific academic goals - University of Oregon, University of Kansas, and University of Pittsburgh - showed above average effectiveness on NYU Book 4A (test of alphabet, numeral and shape names) when compared with the other Planned Variation programs.[2]

The Year Three Planned Variation Study, which used a different test battery, generally supports these findings (Weisberg, 1973). Oregon and Kansas, in particular, and Pittsburgh to a

[1]These procedures are similar to those used in mastery learning curricula and both are often developed in conjunction with criterion-referenced tests. Although these techniques have been successful in teaching specific tasks or skills, the issue of their long-range value for young children is frequently ignored.

[2]These programs were not superior on NYU Book 3D which assessed premath, prescience and linguistic (knowledge of preposition) skills. One possible explanation is that the skills required for this material were not specifically taught by the programs under consideration. Only one of the three programs - the University of Pittsburgh - also indicated above average effectiveness for the Stanford Binet, a test of more general cognitive ability.

lesser extent continued to be particularly effective in achievement test scores (i.e., subtests of the Wide Range Achievement Test, and the ETS Enumeration Test). The University of Arizona, which emphasized learning process rather than content, also had higher achievement test scores than the average Planned Variation program. However, there is inadequate information describing classroom procedures to permit an interpretation of this finding.

In order to determine whether observed classroom procedures were directly related to test results, data from the Stanford Research Institute Classroom Observation Instrument were analyzed (Year Two results). There were four major variables which showed consistent differences between curriculum models: (a) Overall academic activity; (b) adult thought questions; (c) child questions; and (d) independence of the child in non-academic activities. All three programs with above average scores on NYU Book 4A also demonstrated high levels of observed academic activity. There are no clear relationships between the other three observation categories and achievement test results, implying that simply increasing or decreasing these behaviors will not in itself affect achievement scores.

The results of the Follow Through analysis (ABT, 1973) are less clear, though they confirm in part the Planned Variation findings. The One-Year Kindergarten Study (Cohort 3), based on ten sponsors, indicates that the highly structured, achievement-oriented programs (i.e., Kansas, Oregon, and Pittsburgh) are

generally among the highest scoring programs for the Wide Range Achievement Test (WRAT) and the Metropolitan Achievement Test (MAT). High/Scope, which emphasizes general cognitive development and the University of Florida, a parent involvement program, are also among the higher-scoring programs. The table below lists in descending order the programs with the best performance on each test [1].

WRAT	MAT-Sounds	MAT-Reading	MAT-Numbers
Kansas	Oregon	Kansas	Kansas
Oregon	Kansas	High/Scope	Oregon
Pittsburgh	High/Scope	Oregon	Pittsburgh
High/Scope	Florida	Florida	High/Scope

Results of the Follow Through Three Year Longitudinal Study (Cohort 1), based on six sponsors, are partially inconsistent with the One-Year Kindergarten Study. Although one structured academic program (Pittsburgh) had the highest positive effects, another (Oregon) had negative effects in contrast to the positive patterns in the Kindergarten Study [2]. The reasons for these results are

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[1] Unfortunately, the Follow Through results cited here did not compare programs on measures of abstract cognitive ability (e.g., reasoning, problem solving, etc.). For this reason, there is inadequate information on which to base general conclusions as to program effectiveness.

[2] The six sponsors ranked in order of performance on MAT reading, arithmetic and spelling subtests are Pittsburgh, Georgia, Bank Street, EDC, High/Scope, and Oregon.

unclear. There is little systematic information as to the differential implementation of programs across cohorts or across grade levels (Cohort 3 was tested at the end of kindergarten, Cohort 1 at the end of third grade). In addition, although Pittsburgh and Oregon share similar achievement goals, their classroom procedures differ. These procedural differences and their potential relationship to grade level and subject matter area have not been delineated.

The SRI Scale was used to observe each of 12 Follow Through sponsors at one site in Spring, 1972 (Stallings, 1973). Certain classroom process and child focus variables were related to achievement test scores. The relevant classroom process variables were (a) frequency of math and reading activities, (b) adult feedback to children for tasks, and (c) stimulus - response feedback system in academic activities. The child focus variables related to test scores were (a) child responding with academic theme, [1] and (b) child initiating interactions with adult. These findings are consistent with those of the One-year Kindergarten Study which indicated higher achievement scores for individualized academic programs.

The Institute for the Development of Human Resources (Soar and Soar, 1972) also collected observational data using several scales in a small sample of Follow Through classes. Factors of

[1] "Child responding with academic theme" was the only classroom variable which showed consistently high correlations with achievement test scores across grade levels.

teacher-directed vs. pupil-selected activity were derived from two of the scales. These factors were found to discriminate between two of the extreme programs - the University of Oregon and the Educational Development Corporation. These classroom factors then were related to simple-concrete and complex-abstract factor scores [1]. Findings indicated positive associations between teacher-directed classrooms and simple-concrete test scores; however, after a certain point, teacher-directed drill was negatively associated with complex-abstract growth. These findings will be considered in more detail in the section on cognitive goals.

The studies cited indicate that achievement-oriented programs frequently have been successful in implementing objectives and measuring results. Goals, at least in part, have been translated into classroom procedures, and tests are available or can be developed to assess these procedures. Although findings are at times inconsistent, a substantial body of data points to the conclusions summarized above. Both implementation of goals and measurement of program effects become more complex when broader cognitive and non-cognitive goals are considered.

[1] Simple-concrete factor scores include the Metropolitan Readiness Alphabet Subtest and the Early Childhood Inventory Alphabet and Numerals Subtests. Complex-abstract factor scores include the Metropolitan Readiness Word Meaning and Copying Subtests; the Early Childhood Inventory Shape Names Subtest; and the Preschool Inventory Association Vocabulary and Concept Activation Sensory Subtests.

B. Cognitive Goals

Programs with general cognitive goals are based on the rationale that long-term effects are possible only if children are provided with strategies for learning rather than with specific facts. It is argued that if children can conceptualize, reason, or solve problems effectively, these abilities will transfer to subsequent school requirements regardless of the subject matter involved. Programs with general cognitive goals have varied considerably in curriculum and classroom procedure. It is not surprising, therefore, that the results have been inconsistent, and that the potential effectiveness of the programs remains uncertain.

In some cases, cognitive programs provide general goals, with teachers free to select the means of implementation. In others, children are given individualized sequential curricula that are procedurally similar to those administered in achievement-oriented classes. Results of selected studies are summarized below.

An analysis of Year Two Planned Variation data provides scattered and rather speculative results on which to base hypotheses as to the effectiveness of cognitively-oriented programs. The Stanford Binet is the only general cognitive test administered to this sample of children that discriminated between Planned Variation programs. Findings indicate that High Scope was particularly effective, and the University of Pittsburgh and the

Responsive Environments Corporation (REC) scored above the average Planned Variation level on the Stanford-Binet.[1] High Scope also scored above average on Book 3D (premath, prescience, and linguistic skills), while REC scored below average on both Books 3D and 4A. A cursory analysis of program goals indicates that High Scope provides a general cognitive curriculum, stressing learning process rather than content, and an open classroom approach. Both Pittsburgh and REC use some form of programmed instruction. From the available data, it is difficult, if not impossible, to identify classroom procedures to explain the IQ results.

An analysis of the findings as measured by the SRI observation categories indicates that both High Scope and Pittsburgh were significantly higher, and REC significantly lower, in number of adult thought questions. The other three observation categories provide little information. In terms of academic activity, for example, High Scope was significantly lower and Pittsburgh significantly higher than the mean, while REC indicated no trend in either direction. There is no information which would permit us to explain these results.

Soar and Soar (1972) [2] conclude from their observational study of Follow Through classrooms that moderately high levels of freedom seem to relate to complex growth and that simple learning

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[1] In a discussion of the Year 2 Planned Variation results, Smith (1973) notes that both Pittsburgh and REC had only one site in the study and, for this reason, suggests caution in attributing clear effects to these models.

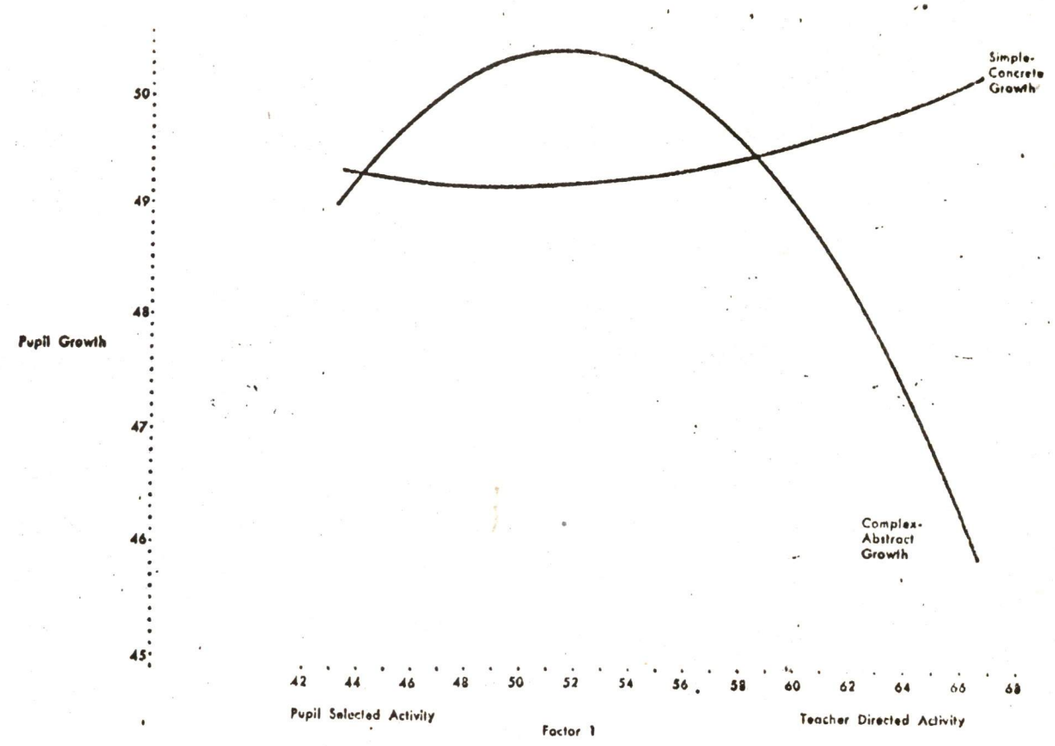
[2] See p. 16 for a description of this study.

is increased by teacher direction, but at the expense of complex-abstract growth. This inference is based in part on the relationships described in Figures 1 and 2 using factors derived from two observation scales. To support these findings, the Soars cite previous studies of third and sixth grade children indicating that the amount of freedom that is functional is related to the degree of abstractness of the learning task.

The Planned Variation and Follow Through results summarized above provide spotty and speculative evidence, but when considered together indicate a basis for developing hypotheses for future research. There is a possible association between programs with general cognitive goals and cognitive test scores. The Planned Variation results suggest, tentatively, that adult thought questions might be related to higher IQ scores. Soar and Soar's observational analysis of Follow Through suggests that moderately high levels of freedom for children in classrooms could be related to abstract growth.

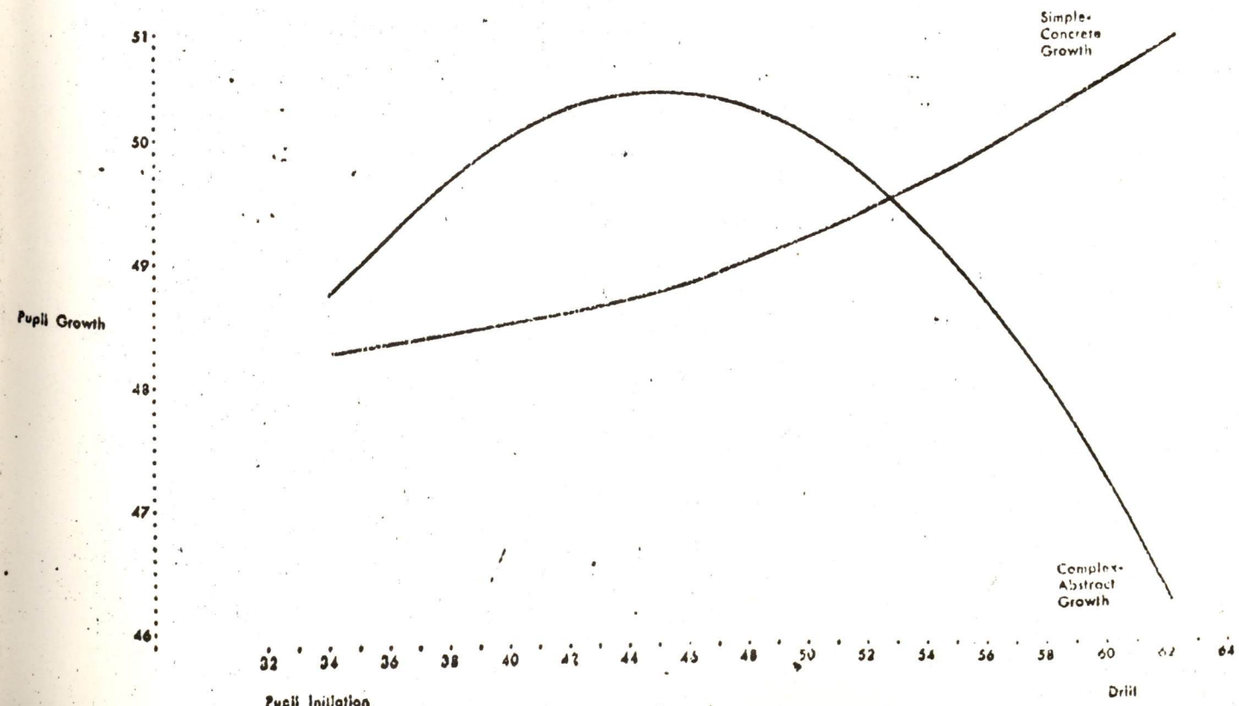
The trend of these results is supported by other, rather diverse studies and curriculum models. For example, studies by Rowe (in press) suggest associations between "wait time" (the interval between teacher's question and student's response), rate of reinforcement, and nature of students' responses. Rowe notes that teachers typically permit students a very short time to respond, followed by immediate reinforcement. She hypothesizes that both short wait time and frequent reinforcement (whether

Figure 1



Relation between Teacher Practices Observation Record factor 1 and pupil growth

Figure 2



Relation between Reciprocal Category System factor 3 and pupil growth

positive or negative) discourage students from exploratory, risk-taking or hypothesis formation behavior. The students' goal in this context is to give the "right" answer quickly, rather than to solve the problem at hand. Rowe's research indicates that by training teachers to increase wait time, a number of student behaviors change. For example, length of response increases, failures to respond decrease, confidence (measured by decline of inflected answers) increases, speculative responses increase, evidence-inference statements increase, child-child comparisons increase, etc. Rowe (1973) also found that children tend to stop experimenting sooner when rewards are high. These behaviors have not yet been validated in terms of other outcome measures.

A Process Approach to Science developed by the American Association for the Advancement of Science (1967; 1967; 1970) combines teaching principles similar to those suggested by Rowe's research, with a sequentially planned curriculum which emphasizes the learning process--ranging from observation and classification for young children to experimentation for older children. The goal is to teach children methods of thinking that generalize to new situations. Criterion-referenced tests are included as part of the curriculum, and there is evidence that children acquire the desired behaviors and demonstrate them in contexts different from those used in instructional activities. Results of comparisons (See

annotated bibliography in Rowe, 1973) between children receiving the Science Process approach and control groups are mixed, but generally favor the experimental groups on a variety of measures (e.g., transfer of learning, IQ, interest in science, etc.). There are, however, no data on long-term effects.

Sprigle's Learning to Learn early childhood program is based on similar principles. The program emphasizes goals for teachers and children, individualization, active child participation, and emphasis on learning process rather than content. A continuum of learning experiences is provided including observation, labeling, discrimination, classification, guesses and hunches, decision making, problem solving, etc. Sprigle is presently analyzing videotapes of the program to identify critical classroom variables. Although the program is no longer in existence, a continuing longitudinal follow-up of the children indicates lasting effects on a wide range of tests two years after entrance into public school. Significant differences between experimental and control groups have been found on both achievement and general cognitive tests.

A final example of a cognitively-oriented program is Blank's (1973) tutorial curriculum to teach precursors of abstract thinking to preschool disadvantaged children. Children are given 15-20 minute sessions within regular school programs. The procedure is individualized and diagnostic; children are led through question

and answer sessions designed to develop cognitive skills involving independent inquiry, hypothesis formation, problem solving, intellectual flexibility, etc.

The program shares with other cognitive programs the goal of helping children acquire strategies for learning rather than specific facts; it includes, however, certain unique combinations of features: (a) A detailed model has been developed in which learning goals (i.e., acquisition of cognitive skills) and appropriate teaching procedures are specified operationally. These procedures are not a curriculum in the usual sense but rather a set of "rules" for teachers to use based on individual children's responses in the tutorial sessions; (b) The sessions are designed to encourage spontaneity in order to develop children's capacity for abstract thought. For this reason, the learning materials and patterns of questions are varied and rote learning and drill are avoided. However, the emphasis is not simply on asking children divergent questions, but on using their responses to develop desired intellectual skills. The teacher molds the dialogue with the child to develop relevant, though varied, responses; (c) Verbal reinforcements are frequent and are given where possible to acknowledge abstract thought.

Three studies were conducted to evaluate the program. Children involved in the tutorial program (15-20 minute sessions, three to five days per week, for a maximum of six months) were compared on

the Stanford Binet and WISC intelligence tests, with children given one-to-one instruction along more traditional lines, and with children receiving only the regular classroom program. In all three studies, children in the tutorial method showed significantly higher IQ gains (an average of 14 points) than children in the other two groups.

Blank has also developed a detailed instrument to code and quantify teachers' and children's behaviors in the tutorial setting. This instrument is designed to indicate the nature of any cognitive change that has occurred. Although it has not been used to compare the tutorial procedure with other programs, it could be modified for this purpose.

The programs summarized in this section suggest alternative and sometimes contrasting learning procedures for achieving general cognitive goals. Most programs emphasize learning process (rather than content) and divergent questioning. Some apply procedures (i.e., clear teacher and student objectives, sequential curricula, individualization, contingent reinforcement, and active child participation) similar in principle to those implemented by achievement-oriented programs. These procedures are generally modified to meet the goal of teaching learning strategies rather than specific information. Other programs, however, stress the value of moderately high levels of freedom for children and question the appropriateness of sequential curricula and step by step reinforcement.

The programs cited as examples have ranged from models in which teachers are given freedom to translate general cognitive goals into curricula, to programs in which sequential learning experiences are specified. When programs are unplanned, it is of course more difficult to identify relationships between classroom procedures and outcome measures. In addition, regardless of program design, few general cognitive tests are available that are relevant to the goals of most programs discussed here.

C. Socio-emotional Goals

Systematic research findings are not available on which to base hypotheses regarding the impact of alternative early childhood programs on socio-emotional development. We know little, if anything, about the effects of programs on basic personality and social development of students. Hypotheses in this area are speculative and are based on informal observations suggesting that certain programs might have positive effects, of unknown duration, on attitudes toward school and learning or on motivation and independence.

This lack of information is largely the result of inadequate theory and methodology. Programs emphasizing socio-emotional goals generally have not described these goals in operational terms. Programs with cognitive objectives have rarely described the potential effects of their curricula and teaching procedures on "non-cognitive" behaviors. This is due, I believe, less to a lack

of interest on the part of program developers than to the non-availability of basic theoretical knowledge as to the impact of varying environments on child development. For this reason, program developers do not describe, except in the most general terms, how teacher behavior will produce desired and specific socio-emotional outcomes. One exception is behavioral modification programs which have demonstrated a short-term effect of consistent reinforcement on child behaviors. There is, however, little evidence of the carry over to situations outside the classroom, nor are there data on more general effects of these programs on child development over time.

In addition, satisfactory measures are not available to assess the impact of programs on socio-emotional development. Observational scales can be used to compare frequencies of certain behaviors in different programs. However, we do not yet know the generality of these behaviors across situations, nor do we know their relationships to other indices of child development. Interpretation of these data will, for the present, be based on value judgments that some behaviors are more desirable than others. Significant progress in evaluating the socio-emotional effects of early childhood programs appears to depend upon basic efforts in measurement theory and technique.

D. Summary of Research Findings

The studies reviewed suggest certain relationships between program goals, classroom procedures and outcome measures. There is evidence that programs with clear achievement goals, sequentially-organized curricula, individualized instruction, and contingent reinforcement are positively related to achievement tests scores. There are also data suggesting that more abstract cognitive development is related to instructional emphasis on learning process rather than content, and to the use of divergent thought questions. There is some indication that clear goals, sequential curricula, and individualized instruction are positively associated with general cognitive as well as achievement outcomes; however, both the optimum level and nature of teacher direction, and the way in which reinforcement procedures can be used most effectively are uncertain. There is no systematic evidence of the socio-emotional effects of programs emphasizing non-cognitive goals, nor are there data describing side-effects of more academically-oriented programs. Hypotheses in this area are based on informal observations suggesting possible associations between certain classroom procedures and school-related outcomes (e.g., students' attitudes toward learning or assumption of responsibility for learning).

III. RESEARCH IMPLICATIONS

This review has suggested the usefulness of planning further research to examine the educational and behavioral implications of alternative classroom procedures, as well as certain methodological constraints that need to be considered in planning the research. The discussion below sets forth a procedure for developing research based upon analyses of past results and methodological issues. The research would be based on clearly formulated hypotheses describing relationships between classroom environments and child development, and would be designed so that salient classroom procedures could be specified and measured. The goal of the research would be to further our knowledge of the relationship between educational procedures used in the classroom and children's academic achievement, abstract cognitive ability, and socio-emotional development. The proposed research would require a rather lengthy design phase to develop appropriate measures of classroom procedures and children's performance. The steps involved in this design effort are outlined below. Although the present research review has focused on studies of preschool and early elementary school children, the approach described here can be applied to a broader range of educational programs.

A. Description of Program Goals, Procedures, and Predicted Outcomes

The purpose of this aspect of the research would be to specify the goals and classroom procedures of a range of educational programs, to serve as a basis for the subsequent development of research hypotheses and the selection of representative programs to participate in the research. These programs would represent varying cognitive and socio-emotional goals. A number of researchers in the field of program development would be invited to participate in this planning effort[1]. Participants would be requested to specify the goals of their programs, the salient classroom procedures hypothesized to be directly related to the accomplishment of these goals, and the anticipated outcomes. They would also be asked to describe in operational terms the classroom procedures they have selected (by indicating the observational categories that would be used to measure them), and to suggest outcome measures they consider relevant to the goals and procedures of the program. Where existing measures were not available, the developmental areas of interest could be specified and new measures proposed.

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[1] Carol Lukas and Anne Monaghan at the Huron Institute and Jane Stallings at Stanford Research Institute have conducted research on program specification and implementation for the Planned Variation and Follow Through studies. Their procedures and findings would be considered in developing specific plans for this phase of the research.

B. Development of Hypotheses

The research hypotheses would be based on program descriptions from (A), as well as on past research findings, developmental theory, and informal observations of programs. Two types of hypotheses would be formulated. The first would describe predicted relationships between alternative programs and child outcome measures. These hypotheses would focus on the impact of the program as a whole. Although salient classroom variables within programs would be specified, there would be no attempt to identify relationships between these variables and outcome measures. This model is similar to the "Comparison of Alternative Programs" design described on page 10.

Under the second type of hypothesis, which would constitute the primary focus of the research, relationships between classroom variables and outcomes would be described (e.g. associations between contingent reinforcement and achievement gains, or between divergent questioning and abstract thought). The concern here would be with the relationships across programs between classroom procedures and outcomes, rather than with the impact of the program as an entity. This model is described in more detail on page 10 in the section, "Comparision of Environmental Variables."

Program models would be selected to participate in the research based on their relevance to these hypotheses. In some cases, currently operating programs would be appropriate, while in others it would be necessary to develop new experimental programs. In both instances, the teaching procedures and predicted outcomes should be explicit and measurable.

C. Development of Measures of Classroom Procedures and Child Outcomes

The identification of hypotheses and programs would be followed by the selection and development of measures of classroom procedures and child outcomes. It is anticipated that observational scales would be used to measure classroom environment, and that both standardized tests and observational scales would be used to evaluate program effects. These measures would be closely related to the hypotheses to be investigated. The research questions that ultimately could be addressed would depend on the quality and range of the measures developed in this phase of the research.

D. Implementation of Research

The research that is implemented would be based on the planning efforts described above. The scope of the study would depend

on the population of interest, the research hypotheses to be addressed, the number of programs and program replications to be included in the study, and the measures and resources available at the time the study is initiated.

However, regardless of scope, the study would be designed to address two types of research questions which parallel the hypotheses previously described. In the first, relationships between alternative programs and child outcome measures would be determined. This analysis would include comparisons between different types of program models. It would also include comparisons between replications of the same model, in order to indicate the association between level of implementation and effectiveness for a given model.

In the second, relationships between salient classroom variables (e.g., individualization of instruction or level of teacher direction) within programs, and children's cognitive and behavioral development would be identified. In this case, the program models are not considered the independent variables, but rather a framework for studying these variables. The level of occurrence of particular classroom variables would be determined across programs, and would be related to differences in outcome measures.

The research objectives described here can best be achieved at this stage of development by conducting relatively small-scale studies. These studies would be most appropriate for

testing hypotheses and measuring critical variables. Larger representative studies would be useful if the objective were to assess the generality of known experimental results. This type of design, however, is not appropriate given the present status of our research knowledge.

REFERENCES

AAAS Commission on Science Education. Newsletter. Vol. 3, No. 3, June 1967.

AAAS Commission on Science Education. Science - A Process Approach. Publication 67-12. Washington, D. C.: American Association for the Advancement of Science, 1967.

AAAS Commission on Science Education. Science Process Instrument. Experimental Edition. Washington, D. C.: American Association for the Advancement of Science, 1970.

ABT Associates, Inc. Education as Experimentation: Evaluation of a Planned Variation Model. Draft report to the Office of Education, Division of Elementary and Secondary Education. Cambridge, Massachusetts: ABT Associates, Inc. 1973. (Mimeo)

Bereiter, Carl and S. Engelmann. Teaching Disadvantaged Children in the Preschool. Englewood Cliffs, New Jersey: Prentice-Hall, 1966.

Blank, Marion. Teaching Learning in the Preschool: A Dialogue Approach. Columbus, Ohio: Charles E. Merrill Publishing Company, 1973.

Bronfenbrenner, Urie. Is Early Intervention Effective? Invited paper, conference of The National Association for the Education of Young Children, Atlanta, Georgia, November 1972. (Mimeo)

Clark, Joan and Wilbur Rippy. Bank Street Approach to Follow Through. 117 slides and accompanying script. New York: Bank Street College of Education, Fall 1970.

Rowe, Mary Budd. Instructor's Manual to Accompany Teaching Science as Continuous Inquiry. New York: McGraw-Hill Book Company, 1973.

Rowe, Mary Budd. Wait-Time and Rewards as Instructional Variables, Their Influence on Language, Logic and Fate Control: Part One - Wait Time; Part Two - Rewards. Journal of Research and Science Teaching, in press.

Soar, Robert and Ruth Soar. An Empirical Analysis of Selected Follow Through Programs: An Example of a Process Approach to Evaluation. In Seventy-First Yearbook of the National Society for the Study of Education, Part II. Chicago: University of Chicago Press, 1972, pp. 229-260.

Smith, Marshall S. Head Start Planned Variations, A Summary of Year Two: Effects of Various Preschool Curricula on Child Outcomes. Cambridge, Massachusetts: Huron Institute, 1973. (Mimeo)

Stallings, Jane A. Follow Through Program Classroom Observation Evaluation 1971-72. Menlo Park, California: Stanford Research Institute, 1973.

Stearns, Marian S. Report on Preschool Programs: The Effects of Preschool Programs on Disadvantaged Children and Their Families. Washington, D. C.: Office of Child Development, Department of Health, Education and Welfare, 1971.

Van De Riet, Vernon and Michael B. Resnick. A Sequential Approach to Early Childhood and Elementary Education. Gainesville, Florida: University of Florida, 1973.

Weisberg, Herbert I. Short Term Cognitive Effects of Head Start Programs: A Report on the Third Year of Planned Variation - 1971-72. Cambridge, Massachusetts: Huron Institute, 1973. (Mimeo)

Westinghouse Learning Corporation. The Impact of Head Start, An Evaluation of the Effect of Head Start on Children's Cognitive and Affective Development: Volume 1, Text and Appendices A-E. Ohio University Report to The Office of Economic Opportunity, Clearinghouse for Federal Scientific and Technical Information, 1969.

White, Sheldon H., et al. Federal Programs for Young Children: Review and Recommendations. Cambridge, Massachusetts: Huron Institute, 1972.