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ABSTRACT

The purpose of this paper is to identify some variations among experimental programs and discuss the manner in which such variations seem to affect a program's success. To accomplish this purpose an in-depth analysis of a few major preschool intervention studies is made in terms of four pertinent variables: (1) Curriculum Model (2) Home Intervention (3) Age at Intervention and (4) Duration of Intervention. The Westinghouse Report evaluating the impact of Head Start, the Gray and Klaus program, the Indiana Project, the Karnes program, the Weikart program, Montessori, and the Bereiter-Engelmann program are compared. A few general observations and tentative speculations are made about several other variables which appear to affect the outcome of preschool interventions. The evaluation of preschool outcomes might involve the four major variables in determining what modifications would improve preschool intervention results with disadvantaged children. (WY)

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Child Development

THE INFLUENCE OF SELECTED VARIABLES ON THE EFFECTIVENESS OF PRESCHOOL PROGRAMS FOR DISADVANTAGED CHILDREN

Howard H. Spicker

In 1967 Hodges and Spicker critically reviewed the findings of preschool experimental intervention programs that had been developed for disadvantaged children to that date. They concluded that intelligence test scores of disadvantaged children could be substantially raised by a home intervention, curriculum intervention or a combination of both; no one approach at that time had proved to be more effective than any other. A comparison of curriculum strategies immediately following the intervention period further indicated that "traditional" preschool approaches had produced slight intellectual gains while those approaches specifically designed to meet the special needs of disadvantaged children had produced much greater intellectual gains; in addition, the latter approaches had substantially increased the linguistic and motoric abilities of the children. The long-range effects of preschool interventions were difficult to assess since follow-up studies had indicated that the I.Q., language, and motor development advantages the experimental children had demonstrated over the control children immediately following the preschool intervention were seldom evident more than one year after the cessation of the experimental treatment. In addition, children who had received the experimental treatment seldom performed better than non-experimental children on standardized tests of reading and arithmetic achievement by the time they had completed second grade. Thus, it seemed that preschool intervention in general had not been able to prevent scholastic failure after regular school entrance.

Drawing similar conclusions through independent reviews of the literature and through surveys of existing preschool programs, Jensen (1969) and the government-sponsored Westinghouse report (Cicarelli, 1969) have seriously questioned the value of preschool programs such as Project Head Start. It is strongly felt by this writer, however, that such general

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condemnations of preschool programs are unwarranted because they assume that all programs are essentially identical. A brief visit to but a few Head Start classes will quickly point to the fact that there appears to be almost as many differences among preschool programs as there are programs. While the bulk of evidence indicates that preschool programs in general have tended to produce few lasting positive results, there is also a great deal of evidence, largely ignored, indicating that there are certain things done in some experimental preschool programs that could greatly enhance the educational possibilities for disadvantaged children when applied in the non-experimental classroom. The purpose of this paper, therefore, is to identify some variations among experimental programs and discuss the manner in which such variations seem to affect a program's success. To accomplish this purpose an in-depth analysis of a few major preschool intervention studies will be made. Only those studies which had adequate experimental designs, appropriate control groups, and sufficiently detailed reports (from which it was possible to isolate and discuss apparently pertinent variables) were selected for this analysis.

Curriculum Models

Prior to the advent of Project Head Start in the summer of 1965, there were few programs for disadvantaged children and even fewer curriculum models that had been specifically designed to remedy the cognitive, motoric, and affective deficits often exhibited by such children. It is, therefore, not too surprising that many Head Start programs adopted the available traditional nursery school curriculum models that had been developed for middle class children. Incidental learning rather than direct teaching best describes most of these traditional models. The primary emphasis tends to be on social and emotional development through the media of unstructured free play, music, dramatics, arts and crafts, storytelling, and games. Intellectual and linguistic growth is fostered indirectly through field trips and other opportunities for exploration and creative play. Convinced that a more efficient approach was needed to ameliorate the learning deficits of disadvantaged children, many of the major preschool research investigators of the 1960's concentrated on the development of new or on the modification of old curriculum models. These efforts resulted in the formulation of at least three major types of curriculum models which differ from each other in their placement of emphases; one type emphasized the increasing of cognitive skills, another the development of perceptual-motor skills, a third the importance of academic achievement. Examples of cognitive models are seen in the curriculum approaches developed by Gray and Klaus (1968), Hodges, McCandless, and Spicker (1967), Karnes, (1969), and Weikart (1967). In general, these approaches all attempt to

improve aptitudes for and attitudes towards school by improving oral language ability, memory, discrimination learning, problem solving ability, concept formation, general information, and comprehension. The specific strategies used to achieve these goals are the major differentiating features of the various cognitive development approaches.

The perceptual-motor model is exemplified by the classic Montessori (1964) curriculum. Visual discrimination and visual-motor integration are the key elements of this model. The Montessori program in particular stresses sensory training and psycho-motor learning through independent manipulation of didactic materials. The approach is thought to teach independence, self-control, and concentration which, ir turn, provide the child with greater self-confidence, maturity, and readiness for school learning.

The academic achievement model is the most direct of the three intervention approaches. It is best illustrated by the Bereiter and Engelmann (1966) curriculum. The model assumes that disadvantaged children fail in school because they receive ineffective instruction. The approach, therefore, attempts to provide effective direct instruction in oral language, reading, and arithmetic prior to first grade school entrance.

Several investigators have recently compared the differential effects of some of these curriculum models. The most extensive of these studies were reported by Weikart (1969) and by Karnes (1969).

The Weikart study compared a traditional model to a cognitive and a direct instructional model. The traditional model emphasized social-emotional development goals. Referring to the traditional model, Weikart states, "The hallmarks of this curriculum are introduction of themes and material to acquaint the child with the wider environment, close attention to the individual social and emotional needs of each child, and a considerable degree of permissiveness in classroom operation"(p. 4). The cognitive model developed by Weikart "... was based on methods of "verbal bombardment, socio-dramatic play, and certain principles derived from Plaget's theory of intellectual development" (p. 4). The direct instructional model was the one developed by Bereiter and Engelmann described earlier. Each curriculum model was presented to a group of approximately 8 functionally retarded disadvantaged three- and four-year-old children on a half-day basis. This presentation was supplemented by a 90-minute home teaching session every other week. The treatment groups were equated by I.Q., sex, and race. Only end-of-first-year data are available at this time. After one year of instruction all three groups had made large I.Q.

increases and substantial social-emotional and general development improvements which, however, were not significantly different from one another. Contrary to expectation the traditional approach developed for middle class children proved to be as effective as the two approaches that had been specifically developed for disadvantaged children.

Similar success with a traditional curriculum approach has recently been reported by Karnes (1969), and by Kraft, Fuschillo, and Herzog (1968). It is important to note that in all three of these studies, the traditional preschool class was under the direct control of the investigators. The teachers and research staffs jointly planned the curriculum and agreed upon the manner in which it was to be presented. In most instances teachers were required to prepare elaborate daily lesson plans. It seems necessary to emphasize that programs such as these are much more structured than non-experimental traditional preschool programs in that the content is planned carefully and presented systematically so as to attain well-defined short- and long-term goals. As pointed out by Weikart, these variations and refinements of the traditional curriculum provided the teacher with a clear-cut theoretical curriculum model; a specialized and stabilized environment in which to work (by such means as specific and uniform planning, united goal-oriented team teaching, involvement in and commitment to project expectations, supervision by experienced teachers); and high expectations for the children (a positive "Rosenthal effect"). Whenever the traditional curriculum model has been evaluated in the absence of the above experimental structure, it has been found to be significantly less effective with disadvantaged children than the specially developed programs (Cicarelli, 1969; DiLorenzo and Salters, 1968; Karnes, 1969).

To determine whether structure is indeed the major variable in curriculum effectiveness, Karnes (1969) evaluated five preschool intervention programs which differed primarily in the degree to which they were structured; structure was here defined as intensity of teacher-child interaction. According to the investigators, the less-structured programs were the "traditional" and "community-integrated" ones; representing increasingly greater amounts of structure were the Montessori, "ameliorative," and "direct verbal" programs. The traditional program, operated by the investigators, emphasized the personal, social, motor, and general language development of the children by capitalizing on opportunities for incidental and informal learning. The community-integrated program, operated by a private community group, was similar in emphasis and differed only in that disadvantaged children were integrated into a classroom of primarily middle and upper middle class children. A program operated by the local Montessori society was selected to represent a child-centered approach

with considerable curriculum structure. The ameliorative program developed by Karnes was a cognitive approach emphasizing language development through manipulation of concrete materials and was supplemented by 20-minute periods for teaching mathematical concepts, language arts, reading readiness, and science-social studies. The direct verbal program was Bereiter and Englemann's approach which stressed pattern drills for teaching language and arithmetic, and also included the teaching of reading by means of a modified initial teaching alphabet.

Each group consisted of approximately 15 economically-deprived children (67% black, 33% white). The mean I.Q.'s of the groups ranged from 93 to 96. All groups received their specific treatment for one year at CA 4. The traditional, community-oriented, and Montessori groups entered a regular 5-year-old kindergarten without further intervention while the ameliorative group received one hour of special instruction in addition to regular kindergarten participation, and the direct verbal group continued to receive the Bereiter-Engelmann program in a special kindergarten. In the third year all children entered regular first grade without further intervention.

The results immediately following the one-year pre-school intervention indicated that the I.Q. and language gains made by the ameliorative and direct verbal groups were significantly greater than those made by the traditional community-integrated and Montessori groups, but not significantly greater than those made by the experimentally controlled traditional group. The relatively good performance of the experimentally-controlled traditional group in contrast to the poor performance of the non-experimentally-controlled community-integrated traditional group is in line with the interpretation made for the similar finding in the Weikart study. However, the relatively poor intellectual increase of the Montessori group requires additional interpretation. Many advocates of the Montessori method are likely to dismiss these findings because the treatment period of one year would not be considered long enough to obtain positive Montessori effects. Although seemingly plausible, this interpretation does not explain the similarly poor cognitive results obtained by Berger (1969) after a two-year Montessori intervention. Furthermore, since the Montessori curriculum is considerably more structured than most traditional programs, the poor cognitive performance of the Montessori group cannot be attributed to lack of structure. As one examines the language performance of Karnes' five groups, a possible explanation for the poor intellectual increases of the Montessori-trained group seems to emerge. Of the five programs tested, the Montessori model produced the poorest language progress as measured by the Illinois Test of Psycho-

linguistic Abilities (ITPA). As indicated previously the Montessori approach stresses sensory training and psycho-motor learning. The program provides little informal teacher-pupil verbal interaction or other specific procedures designed to stimulate pupil verbalizations. Whereas intelligence tests such as the Stanford-Binet are highly verbally loaded, preschool programs that do not stress language development such as Montessori are less likely to produce significant verbal I.Q. gains. However, the Montessori Society might question whether significant I.Q. increases during the preschool years are necessary to ensure later school success. Until school follow-up data of the Montessori approach are made available, this question cannot be answered.

What about differences in effectiveness between the cognitive and the direct subject matter teaching approaches? As previously indicated by the Weikart and Karnes studies, cognitive approaches have produced essentially the same improvement in I.Q., language, and social development as has the Bereiter-Engelmann direct teaching approach immediately following the intervention period. A separate study by Bereiter and Engelmann (1967) reported that in addition to producing highly significant I.Q., language, and social adjustment improvements after two years of instruction (preschool plus kindergarten), their approach had produced mean Wide Range Achievement Test (WRAT) grade equivalent scores of 2.6 in reading, 2.5 in arithmetic, and 1.9 in spelling from six year old children who had not yet entered first grade.

The crucial question, however, is whether these achievement advantages will be maintained once children educated by other preschool approaches are formally taught reading, writing, and arithmetic. Turning again to the Karnes (1969) investigation, we find that the end-of-first-grade reading and arithmetic achievement test scores made by the cognitive ameliorative group did not differ significantly from those made by the direct verbal (Bereiter-Engelmann) group. In fact, the finding that children taught by the Bereiter-Engelmann approach had scored one-half year lower in reading comprehension (1.7) than in reading vocabulary (2.24) on the California Achievement Test seems to be an indication that the approach is teaching the mechanical skills of reading rather than reading comprehension. This may account for the unusually high achievement test scores made by the Bereiter-Engelmann trained children on the Wide Range Achievement Test which measures word recognition ability rather than reading comprehension, and arithmetic computation rather than arithmetic reasoning.

The follow-up data from the Indiana Project (Hodges, McCandless, and

Spicker, 1967) provide additional input into the preschool curriculum ingredients needed to produce successful scholastic achievement. The project consisted of three studies. In each study three groups of approximately 15 children in each were formed: an experimental kindergarten, a kindergarten contrast group, and an at-home contrast group. In each study the experimental group received a one-year structured curriculum designed to remedy specific diagnosed deficits of individual children in language development, fine motor coordination, concept formation, and socialiaztion. The kindergarten contrast groups received a one-year traditional kindergarten curriculum similar to that described in the beginning of this section; the at-home contrast groups remained home and received only pre- and post-testing. The results obtained from the first two studies (Studies I and II) are extremely relevant to the discussion of curriculum effects. Despite similar I.Q. increases of approximately 20 points on the Binet and 30 points on the Peabody Picture Vocabulary Test, as well as similar language increases of approximately 19 months on the ITPA, the follow-up data through second grade for the Study I and Study II experimental groups were radically different. At the end of second grade the experimental groups were radically different. At the end of second grade the experimental children from Study I were achieving almost a year behind their middle class chronological age (CA) peers while those from Study II were achieving at or near the grade level of their CA peer group. The achievement differences appear to be directly related to major changes that had been made in the experimental kindergarten of Study II curriculum. The curriculum became more structured than it had been the previous year. Language lessons were developed around traditional school themes such as the farm, home, foods, transportation, and community helpers; these themes were adhered to throughout the day in such activities as the story of the week, adaptive art, music, and physical education. In addition, a series of lessons designed to improve fine motor abilities was introduced. An analysis of the Stanford-Binet test items that had entered into the I.Q. gains of the two experimental groups indicated that Study II experimental children had acquired school-related skills to a greater extent than had the experimental children in Study I. They were able to remember instructions and execute them; they excelled in behavior requiring motor skills; and they were superior in expressive vocabulary and number concepts. In short, the group had acquired the techniques for attacking the formalized, rote-memory types of tasks typically expected of them in the elementary schools they entered. It thus appears that if one has no control over the follow-on elementary grade curriculum, a preschool intervention, to have long-term success, must provide the child with experiences that will prepare him for the existing school situation. Hopefully the government sponsored Project Follow-Through program will offer investigators an opportunity to develop experimental primary grade curricula which will be more

effective than most traditional ones in building upon the skills learned in some of the more innovative preschool programs.

It is quite apparent from the above discussion that a curriculum model, although highly important, is one of the variables which influences the effectiveness of preschool intervention programs. There are, of course, other variables which might affect intervention outcomes.

Home Intervention

The specific contribution of a home intervention program to the intellectual development of disadvantaged four-year-old children was recently reported by Karnes (1969). Mothers of children not attending a preschool program were provided eleven weekly two-hour sessions at a neighborhood elementary school. These sessions emphasized procedures for increasing the language abilities of their children and also provided opportunities for the mothers to prepare inexpensive instructional materials for use in the home. The three-month program resulted in a 7-point Binet I.Q. increase for the experimental children and no I.Q. gain for the control children.

On the basis of the positive effects of the short term home intervention on intellectual development, Karnes added a home intervention program to her ameliorative curriculum described earlier. At the end of the seven month intervention period, scores achieved on the Binet, Frostig Development Test of Visual Perception, and the Metropolitan Readiness Tests showed the performance of the ameliorative group with mother involvement to be almost identical to that of the ameliorative group without mother involvement. These two investigations seem to indicate that a home intervention contributes to intellectual development when no preschool program is available to the child, but apparently it adds little to the benefits the child derives from a full-time preschool curriculum intervention alone.

Although home interventions seem to contribute minimally to I.Q. increases of children receiving an intensive preschool curriculum intervention, family involvement does appear to contribute in other ways. For example, let us look at the benefits of a home intervention that is coupled with a short-term school program. As indicated by the Westinghouse study (Cicarelli, 1969), short-term curriculum intervention programs such as summer Head Start have been highly unsuccessful. Yet, one notable exception has been the Klaus and Gray (1968) Early Training Project. With only a two to three summer curriculum intervention program lasting ten weeks for a period of four hours a day, significant I.Q. and language gains were made by experimental groups of four and five year old black children.

It should be noted, however, that the mothers and their experimental children received weekly home visits (from teachers who provided instruction to the children in the presence of their mothers) for a minimum of two school years until the end of grade one in addition to the short-term summer preschool intervention. Although the extremely innovative curriculum developed by Klaus and Gray for the project should not be ignored as a contribution to the positive results of the study, it is highly unlikely that the program would have been as successful without the home intervention component. It seems safe to conclude that communities that can only provide short-term preschool programs to disadvantaged children should supplement them with a home intervention.

There appear to be still other benefits accruing from home intervention programs. As pointed out by Gray (1969), in urban communities where families tend to live close together, there is a high probability of positive spill-over effect from the experimental children and their families to children and families who live in close proximity but are not receiving the experimental treatment; this phenomenon is called horizontal diffusion. An even more intriguing side effect of a home intervention is what Gray calls vertical diffusion, the spread of effect from older to younger siblings. It was found that younger siblings closest in age to the experimental children scored significantly higher on the Binet than the younger siblings from the control groups. Furthermore, the effects of the intervention techniques taught the mother seem to spread more to the children closest in age to those from whom the technique was designed. It is quite possible that the indirect positive effects of home and preschool interventions on neighborhood children and younger siblings may be even greater than the direct effects of the interventions on the children receiving them.

Age at Intervention

It is generally assumed that the earlier one intervenes with disadvantaged children, the better will be the result. Until some of the ongoing infant intervention projects are completed, however, this assumption can only be examined partially by comparing existing intervention studies that began with either 3, 4 or 5-year-old children.

Is an intervention initiated with three-year-old children more effective than one initiated with four-year-olds? In still another study conducted by Karnes (1969), that investigator compared the effects of her ameliorative program initiated with three-year-old disadvantaged children to the effects of her program initiating with four-year-olds. She found no significant differences between the progress made by the three-year-old children and

that made by the four-year-old group after a one-year intervention. Both groups had gained an average of 15 I.Q. points on the Binet, 11 points on the Peabody Picture Vocabulary Test, and 7 months in total language age on the ITPA. During the early phases of his intervention work (Waves 0 and 1), Weikart (1967) also failed to find any advantages to an intervention begun at age three when compared with one begun at age four. However, after the experimental curriculum had been strengthened by applying the concepts of intellectual development devised by Piaget, subsequent interventions (Weikart, 1969) produced substantially higher overall I.Q. and language gains when initiated with three rather than four-year-old children. On the basis of these findings it may be that an intervention with three-year-old children is more effective than one initiated with four-year-old children only when the curriculum intervention starts with the cognitive stage at which the children are functioning and proceeds systematically toward the higher cognitive stages described by Piaget. In addition it is possible that the interest levels of three and four-year-old children are sufficiently different to require major curriculum variations.

The question of whether an intervention initiated at age four is more effective than one initiated at age five is difficult to assess since no one curriculum has been initiated at both of these age levels for the sake of comparison. The closest approach that can be made towards answering this question is to compare the Weikart (1969) Piaget-based curriculum effects on four-year-old children to the Indiana Project's (Hodges et al., 1967) diagnostically-based curriculum effects on five-year-old children. With the exception of the different intervention strategies employed, the two studies are directly comparable since both used borderline intellectually subnormal disadvantaged children as subjects. The I.Q. and language gains made by the two groups of children were almost identical, indicating that the Indiana curriculum begun at age five was as effective as the Weikart curriculum begun at age four. Whether the Weikart curriculum is more effective with four- than five-year-old children, or whether other curriculum approaches begun at age four are more effective than the Indiana approach begun at age five must await further research.

Duration of Intervention

The discussion thus far has been limited to the effects of preschool interventions that were either extremely short in duration, such as summer programs, or those that continued for a period of one year. What about the effects of longer periods of preschool intervention? Because of extremely high classroom attrition in most inner city schools it is very

difficult to keep an experimental group together for more than one year. As a result there are very few studies to draw upon for an analysis of long-term intervention effects. Two of the investigators who were able to maintain their groups over a two-year period experimented with the Bereiter-Engelmann approach. The first study was conducted by Bereiter and Engelmann (1967) themselves. The investigators chose Head Start-eligible four-year-old disadvantaged children with mean Binet I.Q.'s of 95; the experimental children who received a two-hour-a-day Bereiter-Engelmann curriculum showed a 17 point gain during the first year and an additional 9 point gain during the second year. The comparison group which received a two-hour-a-day "traditional" curriculum made an 8 point gain the first year and lost 3 points the second year. In the Karnes (1969) curriculum comparison study reported earlier, the Bereiter-Engelmann trained group made Binet I.Q. gains of 13 points during the first year and 6 additional points during the second year of intervention. Although the Karnes group I.Q. gains were slightly lower in both the first and second years than were the gains reported in the Bereiter-Engelmann study, the findings of the two studies are quite similar. Both studies appear to indicate that intelligence test scores can indeed be further increased by adding a second year of intervention; however, it would seem that the second year increases tend to be one-half as large as those produced during the first year.

Another study for which two-year intervention data are available is that of Weikart (1967). After an initial Binet I.Q. gain of 12.8 points (at age 4) and 11.5 points (at age 3) during the first year of intervention for his "Wave 0" and "Wave 1" groups, the children demonstrated a slight mean loss of 2.1 and 1.5 points respectively during the second year of preschool.

In a two-year intervention study begun with 3-year-old children, Karnes (1969) produced a Binet I.Q. increase of 12 points the first year and no further increase the second year with her ameliorative program. Whereas one might conclude that the second year of intervention was effective because it helped maintain the I.Q. increases made during the first year of intervention, one might just as easily conclude that the intervention curriculum needed to be strengthened. As indicated previously, Weikart subsequently strengthened his curriculum and as a result he has been able to better than double the I.Q. increases he formerly obtained with three-year-old children. Unfortunately, data on the effectiveness of his modified curriculum over a two-year period are not yet available. The absence of other long-term experimental studies makes it extremely hazardous to draw any final conclusions regarding

the effects of extended preschool intervention studies at this time.

Other Related Variables

There are several other variables which appear to affect the outcome of preschool interventions. Unfortunately, there is at present little available specific data from which one can analyze these variables in depth. A few general observations and tentative speculations about some of these variables, however, may be helpful in planning future programs.

A common feature to all of the "successful" intervention studies was the large proportion of adults to children in each of the experimental classrooms. In no case was the ratio lower than two adults to every 15 children. Generally, there was one teacher and one aide. In every instance the aide, with daily in-service instruction from the head teacher, was expected to teach and interact with individual as well as groups of children. This is a significant departure from the kinds of non-academic chores usually delegated to aides (e.g. setting out materials, cleaning up messes, preparing snacks, serving lunches, supervising free play); this change in aide role constitutes a practical procedure for providing the more individualized instruction that disadvantaged children require.

A variable inadequately researched but often mentioned as a major factor affecting the long-term outcomes of preschool programs in the "school environment" to which the child is exposed following the preschool intervention. "School environment" here refers to such factors as appropriateness of curriculum, teacher competence and teacher attitudes toward disadvantaged children. Some of the recently sponsored government experimental Follow Through projects should provide us with data on what constitutes an appropriate follow-through curriculum for disadvantaged children. Perhaps they may even identify specific competencies and attitudes specifically needed by teachers to effectively teach disadvantaged children.

These, then, are some of the major variables which appear to influence preschool experimental intervention outcomes. The time is long overdue to apply these experimental findings to general preschool programs such as Head Start to determine whether such modifications will improve preschool intervention results with disadvantaged children.

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