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This experiment was based on the assumption that the academic failure of the disadvantaged or middle class child is due to a failure of instruction and that if above-normal learning schedules were maintained, the second year of an enrichment program would not show the customary drop in gains from the first year. The subjects of this study were 43 disadvantaged Negro and white 4-year-olds of high, middle, and low intelligence. Fifteen of the children were placed in an experimental group (I) and 28 in a control group (II). A 2-year program involving a group (III) of middle class 4-year-olds was also conducted, with a control group (IV) consisting of middle class 4-year-olds in a Montessori preschool. Groups I and III received a 2-year experimental program in which rapid attainment of basic academic concepts was emphasized. Group II received a 2-year traditional preschool education. Group I achieved significantly greater Stanford-Binet IQ gains than Group II and maintained them over the 2-year program. Group III children also benefited measureably from the program and demonstrated greater achievement in many areas than Group IV. (WD)

The Effectiveness of Direct Verbal Instruction on IQ Performance and Achievement in Reading and Arithmetic

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Problems

Many programs designed to provide culturally disadvantaged preschool children with "Headstart" or "catch up" instruction are premised on the assumption that the goal of early education is to somehow "stimulate" intellectual development.

The basic assumption is expressed by Hunt (1964) who refers to the match between the child and the environment, a match not in terms of the specific skills which the child has mastered and the specific skills he is ready to learn, but a match in terms of some general intellectual processes. According to Hunt,

> ...I have viewed the effects of cultural deprivation as analogous to the experimentally found effects of experimental deprivation in infancy. I have pointed out the importance and the dangers of deriving from "the problem of the match" in attempting to prescribe from existing knowledge a program of circumstantial encounters for the purpose of enriching the experience of culturally deprived pre-school children. In this connection I have suggested that we re-examine the work of Maria Montessori for suggestions about how to proceed. For she successfully based her teaching method on the spontaneous interest of children in learning, and answered the problem of the match with careful observation of what interests children and by giving them individual freedom to choose which of the various circumstances made available they would encounter at any given time. (p. 242)

The rationale behind Hunt's prescription is strongly influenced by Piaget's explanations of how children develop. The Piagetian explanation is not based on the specifics of what a child must learn to handle a particular task, but on general processes and non-specific operations.

The present study is based on the assumption that a child who achieves well on an intelligence test or a more specific

test of academic achievement has been taught the skills that are being tested. The notion of some general, non-specific mechanism is rejected, and the child's competence in any skill area is seen as the product of specific instruction. The primary hypothesis tested by the present experiment is that effective instruction can substantially increase the rate at which disadvantaged children and middle-class children are taught new behaviors relevant to both general and specific achievement areas. The experiment views the failure of the disadvantaged as a failure of instruction, and to a lesser degree, it views the failure of the average middle-class child to perform better than the statistical norm as a relative failure of instruction. It follows that if teaching is made effective and economical (as measured by the rate of achievement) the learning of disadvantaged children and middle-class children can be accelerated.

A secondary hypothesis investigated by the present experiment concerns second-year failure of preschool programs that achieve a performance gain during the first year. Virtually every head-start type program achieves a slight gain during the first year of instruction (typically 6-8 points on IQ scales); when programs are extended a second year, however, mean IQ's drop. In the present experiment the second-year drop is viewed as a function of poor instruction. If children continue to learn concepts at an above-normal rate during the second year, their performance cannot drop. Therefore, the problem is simply one of designing instruction that teaches the children at an above-normal rate. It is hypothesized that the type of direct verbal instruction received by the experimental subjects will be capable of maintaining above-normal learning during both the

first and second year of preschool instruction.

Method

Subjects

The disadvantaged subjects for the present experiment were four-year-old culturally disadvantaged children who would be eligible for Head-Start. The selection criteria were:

1. According to Warner ratings of occupations (1949) and housing ratings obtained through the City Planning Commissioner's office, subjects were from low socioeconomic homes (mean weighted S.E.S. in the low 40's);

2. Subjects were four years old by December 1, in keeping with public school's entrance policies;

3. Subjects did not have previous preschool experience;

4. Children with gross physical handicaps and severely retarded children were excluded.

Subjects received Stanford-Binet tests and were divided into three groups--high intelligence, middle intelligence, and low intelligence. Children were assigned to the experimental and comparison classes with each class receiving the same proportion of highs, middles, and lows. Adjustments were made so that each class had approximately the same proportions of Negro-to-whites, and a nearly equal number of male and female subjects. Fifteen children were assigned to the experimental group and twenty-eight to the comparison group. The composition of both groups is summarized in Table 1.

Table 1

Characteristics of Disadvantaged Subjects

Subjects	Mean CA	Mean Binet I.Q.	White	Negro	Male	Female	Mean Weighted S.E.S.
Experimental N=15	4-3	95.33	6	9	8	7	41.93
Comparison N=28	4-3	94.50	11	17	15	13	42.50

In addition to the disadvantaged subjects, eighteen middle-class four-year-old children were selected for a two-year program. These subjects were not given IQ tests upon entrance. They were introduced into the experiment to demonstrate the differential effects of the experimental program on children who might be considered developmentally impaired and these considered normal. The control for the middle-class children was a group of middle-class four-year-olds in a Montessori preschool. The subjects in the experimental program were referred by parents of the Montessori children as children whose parents would be interested in a Montessori type of education (or a relatively intensive preschool education). Some of the experimental children were on the Montessori waiting list. The selection criterion was adequate, it was felt, to identify children who should be roughly comparable to the Montessori children. The Montessori controls were the same age as the experimental children began their program.

Evaluation of Performance

The disadvantaged children were given Stanford-Binet IQ

tests after the first and second year of instruction. The middle class received Stanford-Binets only after the second year of instruction. These tests were taken as a measure of "general achievement," primarily in language concepts. The disadvantaged and middle-class subjects in the experimental program were also tested on reading, arithmetic, and spelling achievement with the Wide-Range Achievement Test (1965). This test was selected for evaluating the subjects because:

1. There are fewer potential sources of extraneous difficulty. The instructions are uncomplicated, and the tests are clearly tests of relevant content. For a child to achieve a given score in reading, he has to read--not circle words or follow complicated instructions.

2. No multiple-choice items appear in the Wide Range, which means that the children cannot receive a spuriously high score because they happened to guess correctly.

3. The Wide Range is capable of measuring achievement below the first grade level.

The disadvantaged children in the comparison group were not given achievement tests, because they were not taught skills in reading, arithmetic, or spelling. The Montessori group was given the Wide Range test after they had finished their pre-kindergarten year.

Procedure

The subjects in the disadvantaged comparison class received a traditional preschool education. During the first year, they attended a two-hour-a-day preschool based as closely as possible on the recommendations of child development authorities. The

emphasis of the program was on play, self-expression, developing a positive self image through role playing, and typical nursery-school activities. The preschool was outfitted with a sand table, dress-up corner, and a variety of toys. The children to teacher ratio was about 5 to 1. During the second year, comparison subjects went to public-school kindergartens.

The middle-class comparison group attended a Montessori program which operated for three hours a day. The emphasis of the program was on non-verbal manipulative activity. The child to teacher ratio was about 10 to 1.

During the first year, 15 disadvantaged children and 19 middle-class children were enrolled in experimental programs for two hours a day. Three of the disadvantaged children were not continued in the program the second year, and 12 middle-class children were not continued. The 12 remaining disadvantaged children and 7 middle-class children were integrated in a single class and received a second year of two-hours-a-day instruction. Throughout the two-year treatment, the child to teacher ratio was about 5 to 1.

The Experimental Program

The emphasis of the experimental program was on rapid attainment of basic academic concepts. The children attended three twenty-minute classes daily--a language concept class, an arithmetic class, and a reading class. For these classes, the children were divided into small (4-7 children) relatively homogeneous groups (based on performance in the classroom). For the remaining hour the children engaged in a period of semi-structured activities (writing, drawing, working reading-readiness

problems), a music period (in which the songs were geared to the concepts presented in the language-concepts program), and a juice-and-toilet period.

Both the content and the style of teacher presentation used in the language, arithmetic, and reading sessions derived from a relatively simple principle: teach in the fastest, most economical manner possible. In language, the children were taught how to use a "minimum" instructional language. The language derived from the requirements of future teaching situations. In all teaching situations, the teacher would present physical objects of some kind and call the children's attention to some aspect of the objects--perhaps the color, perhaps the relative size, perhaps the position in relation to another object. The teacher would also "test" the children, primarily by asking a child (or the group) questions. The basic language that is needed for all such instructional situations is one that adequately describes the objects presented, that adequately calls attention to the conceptual dimension to which the teacher is directing the children, and that allows for unambiguous "tests" or questions.

The language that satisfies the requirements of the teaching situation consists of the two statement forms,

This is a _____.

This _____ is _____.

with plural and <u>not</u> variations (This is not a _____), with <u>yes-no</u> question (Is this a ball?) and with the <u>what</u> question (What is this?).

The basic language of instruction was taught. The language

teachers did not use a rich variety of expressions; rather, they confined themselves to the basic patterns noted above until the children had demonstrated through performance that they understood the statements and the relationships between statements and questions.

The content that was taught in connection with the basic language consisted of names of common objects, polars (hot-cold, wet-dry, big-little, long-short, etc.), colors, prepositions, and hierarchical classes (vehicles, buildings, tools, clothing, weapons, etc.). After the children mastered the basic language they were introduced to tense variations, action verbs, conditional statements, and, or, if-then, and only. Finally, the children were taught methods for defining words (through genera and differentia), and for describing complex figures and events.

In arithmetic, the children were taught how to count objects and events (Tell me how many times I clap). They were then shown how addition, subtraction, and multiplication reduce to counting operations. For example, the children were shown how to translate such problems as

5 + 3 = b

into the counting operation: start out with five; get more; get tgree nire; and you end up with _____; we have to count them to find out.

All addition problems were reduced to this operation. The children were taught some rote facts, such as the series

1 + 1 = 2

2 + 1 = 3

3 + 1 = 4

etc..

which articulates the relationship between counting and adding; however, there was no attempt to teach the children an exhaustive set of arithmetic facts. Rather, the emphasis was on the operations that would lead to a correct solution.

The children were introduced to algebra and story problems early. To work algebra problems, the children used a variation of the translation they were taught for handling regular problems. For example, the operation for handling the problem

$$5 + b = 8$$

was: start out with five; get more; we don't know how many more, but we know we end up with 8. By starting out with five and getting more until he ends up with eight, the child discovers how many more he has to get.

The initial story problems were quite similar to the statement operations taught in connection with each type of problem. For example: a man starts out with five balls; then he gets more; he gets three more; how many does he end up with? The problem translates directly into the arithmetic statement:

$$5 + 3 = b$$

Problems were then systematically de-structured. That is, synonymous expressions were systematically introduced. After the children had learned to handle the basic story problems, the children were introduced to problems in which a man <u>has</u> so many balls, in which he <u>finds</u> so many balls, in which he <u>makes</u> so many balls.

The children were taught to read according to a modified ITA approach. The innovations which were introduced into the experimental program (primarily with the low performing children)

had to do with the formation of long-vowel sounds and the convention for blending words. The following symbols were introduced to designate long-vowel sounds: $\bar{a}$, $\bar{e}$, $\bar{i}$, $\bar{o}$. The rationale for these symbols was that they could be introduced to help the child "spell" or sound out a variety of long-vowel words; after the children learned these words (s$\bar{o}$, g$\bar{o}$, n$\bar{o}$, h$\bar{e}$, sh$\bar{e}$, m$\bar{e}$, s$\bar{a}$ve, f$\bar{i}$ne, etc.), the diacritical mark could then be dropped without grossly changing the total configuration of the word.

To help the children learn how to blend words, a skill disadvantaged children often fail to master after years of reading instruction, only continuous-sound words (fan, not ban or tan) were introduced initially. The children were taught how to proceed from letter to letter without pausing. In sounding out words in this manner, the children were actually saying the words slowly and could see the relationship between the slowly produced word and the word as it is normally produced. To assure adequate performance in blending, the children were given say-it-fast drills with spoken words. "Say it fast and I'll show you the picture: te-le-phone."

As early as possible, the children were introduced to controlled-vocabulary stories. After reading the stories, the children took them home. Taking stories home functioned as an incentive.

In each of the three study areas, the teachers proceeded as quickly as possible, but only after the children had demonstrated through performance that they had mastered the skills that they would be expected to use on higher-level tasks.

The above description of the curriculum is very rough. In

each of the major subject areas, there are many sub-tasks. To teach each of the sub-tasks, the teacher had to take a number of steps. For example, to teach the children to blend words that are presented orally (a sub-task reading), the teacher first presented two-part words, each part of which is a word--ice-cream, motor-boat, snow-man. Next, the teacher introduced relatively long words the parts of which were not "words," sit-ting, shov-el, mon-ey, etc. Next, the teacher broke the words that has been presented into more than one part--mo-tor-boat, snow-ma-n, sh-ov-el. The teacher then introduced shorter words, broken into two parts: si-t, bea-t, c-ream, m-an. Finally, the teacher introduced short words that were divided into individual phonemes--m=a=n, s-i-t, sh-o-v-e-l. A more detailed description of the arithmetic and language programs is contained in, Teaching Disadvantaged Children in the Preschool (1966).

The Teacher's Behavior

The teacher had three primary roles in the experimental program:

1. She managed the group of children, keeping them on task;

2. She taught concepts;

3. She tested the children's knowledge of concepts before either providing a remedy or proceeding to the next task.

The general rules that guided her behavior in all three areas were:

1. Teach as rapidly and economically as possible. Don't assume that the children know anything unless they have demonstrated that they do;

2. Get as many correct responses and as few incorrect responses out of the children during the alloted time as

possible.

3. Teach the behaviors necessary for successful classroom performance as economically as possible.

The goal of the program was to induce learning at an above average rate, which meant that the procedures that induce learning at a normal rate were rejected. The teacher did not first "shape" behavior and then introduce academic content. She simultaneously introduced academic content and the rules of behavior associated with the content. The focus was always on the behavior related to the task, never on behavior in the abstract. The sanctions that were used were:

Negative:

Loss of food reinforcers (raisins, juice);

Additional work ("If you keep that up, you'll have to work when the other children are singing. You're here to work.");

Physical manipulation (tugging on an arm to secure attention, tapping leg, physically turning children around in seat, turning face toward presentation);

Scolding, usually in loud voice ("Cut that out! Sidney! Look here!")

Repetition of task ("Do it again...Again...Again...Again. Now, after this when I tell you to do it, you do it.")

Positive:

The use of reinforcing objects in presentations ("Look at that silly number. That's 7. I can't stand a 7. I have to erase it. Oh, there's another 7. I can't stand a 7...");

The use of personalization ("Here's a story about, guess who! Sidney!");

The use of mock shock ("Everybody knew the answer. And I just said nobody will know the answer. You guys really fooled me.");

The use of praise ("How, did you hear Sidney? He's a smart boy. Let's clap for him. He is smart and he's working hard.");

Dramatic change of pace (After having the children repeat a series of statements in unison, the teacher stops. The room is dead silent. The children look at each other and smile. Then they laugh. The teacher interrupts in a loud voice, "Okay, let's hear it: four plus zero equals four.");

A dynamic presentation of objects (During a two-minute segment, the teacher may present as many as 30 objects--some repeated--and as many questions. "Tell me about this...What about tgus...And this...And this...");

Positive speculations ("Boy, will your mother ever be surprised when she finds out that you can read. She'll say, 'I never knew you were so smart.' That's what she'ss say.");

Exercises with a reinforcing pay-off ("Everybody likes to erase numbers, right? So I'll point to and you can erase it.");

Relating positive comments of others--both real and fictitious ("Do you know what the man who watched you read said to me? He said, 'These are the smartest kids I've ever seen in my life.' And you want to know something? He's right.");

Food rewards ("If you do a good job on this problem, I'll give you some raisins. So work hard.");

Fooler games (The children say that when they add 3 to 4, they end up with seven. The teacher says, "So I write a 7." She writes a 4. The children object, and the teacher pouts, "I

guess I just can't fool you guys." The children laugh.);

Hand shakes ("Sidney did such a good job that I'm going to shake his hand. Good boy, Sidney.");

Special privileges ("Sidney is working so hard I'm going to let him be the teacher.");

Singling out member of the group for praise ("Debby did it that time. I didn't hear the rest of you guys, but I sure heard Debby. Let's do it again; see if anybody else can say it like Debby does.");

Presenting take-homes ("Tell me this sound and you can take it home.").

The teacher had a full range of social and physical reinforcers at her disposal to use as the situation demanded. Some of the reinforcers listed as positive reinforcers are "acquired." Once taught, however, they proved to be quite effective in influencing behavior, increasing attention, and maintaining the kind of concerted participation that might be called "working hard."

Note that the primary reinforcing emphasis was on positive reinforcement. The teacher used herself as a model, ""I'm smart. I can do this stuff." She used the other children in the group as a model. "Did you hear Sidney? He and I are the only ones who can do this. We're smart." She always tried to acknowledge the correct responses of every child in the group. "Hey, everybody did it that time. Boy you are smart kids. Good work, Tyrone. You too, Lisa."

When the teacher presented concepts, she utilized some of the reinforcing techniques noted above. She moved quickly so

that the children were not confronted with a static presentation. She spoke loudly one moment, softly the next. She presented interesting examples of the concept, when the interesting aspects of the objects did not interfere with the concept being taught. She structured the presentation so that the children had a pay-off--perhaps playing a fooler game, perhaps a hand-out for correct responses.

In addition to the reinforcing aspects of the presentation, however, the teacher followed a basic rule in presenting any new concept: The presentation must be consistent with one and only one concept. When the teacher presented the concept big, for example, she used the same statement forms, "This _____ is big," and "This _____ is not big," to describe a variety of object pairs--cups, circles, figures, men. Each of the objects in the pair was identical except for size. Through this type of presentation, the teacher demonstrated what the invariant big means. She further demonstrated the type of statements that are used to describe the invariant. "This cup is big; this ball is big; this man is big..."

Because of the presentational requirements necessary to demonstrate a concept, the teacher presented a great many examples, usually 10-15 times more than are used by the average classroom teacher (a judgment based on the presentational suggestions of instructional programs designed for children in the early primary grades).

The teacher tested the children on various levels of performance. The first test of a concept was whether the children could find (or point to) the appropriate example. "Find the man

that is big."

The next test was whether the children could answer yes-no questions about an object the teacher pointed to. "Is this ball big?...Is this ball big?"

The next test was whether the children could answer what questions. These are more difficult than yes-no questions because the children must supply the content word. "This ball is what?...Yes, this ball is big."

The teacher usually introduced the various tests rapid fire, in no particular order. However, if the children had difficulty with a what questions. "Sidney, find the ball that is big Good. This ball is big. Is this ball big?...Yes, this ball is big. This ball is what?...Yes, this ball is big."

While the rate at which questions are presented to the group and to individuals in the group varied with the tasks, the teacher often introduced as many as 20 questions a minute. She used the children's responses to these questions as indications of whether or not they had learned the concepts she was presenting. She geared her presentation to the lowest performer in the group, because the goal of instruction was to teach every child each criterion skill. (If a child consistently lagged behind the others in the group, he was moved to a slower group in which his performance was more consistent with that of the other members.)

Results

IQ Performance of Disadvantaged Subjects

The disadvantaged subjects in the experimental program achieved significantly greater Stanford-Binet IQ gains than the

subjects in the comparison program. More important, the mean IQ of the experimental subjects after two years of instruction was 121.08 well above the mean of normal, middle-class children. The mean of the comparison group was 99.61 after two years of instruction.

Figure 1 shows the IQ performance of the experimental and comparison groups after one and two years of instruction. The comparison group achieved an 8.07 gain after the first year of instruction, but had a loss of 2.96 points after the second year (which is typical of early compensatory programs). The experimental group showed a 17.14 gain after the first year and an 8.61 gain after the second year.

Table 2 shows the performance of the individual disadvantaged subjects after one and two years of instruction. The mean first year gain of those children who were retained in the program for two years was 15.00 (IQ 112.25). The mean gain of those who were not continued a second year was 25.67 (IQ 113.33). The total mean gain for the two-year subjects after the second year of instruction was 23.83.

There was only one instance of an IQ loss in either the first or second year of the experimental program. Subject DW had a second year loss of 5 IQ points. None of the experimental subjects experienced an overall loss. The lowest gain was 10 points. The largest total gain was 42. The lowest IQ score after two years of instruction was 103 (subject TA). The highest IQ score after two years of instruction was 139 (subject BG).

Table 3 shows the IQ performance of the disadvantaged children in the comparison group after two years of instruction.

Figure 1

Stanford Binet IQ Performance of Disadvantaged Subjects after One and Two Years of Training

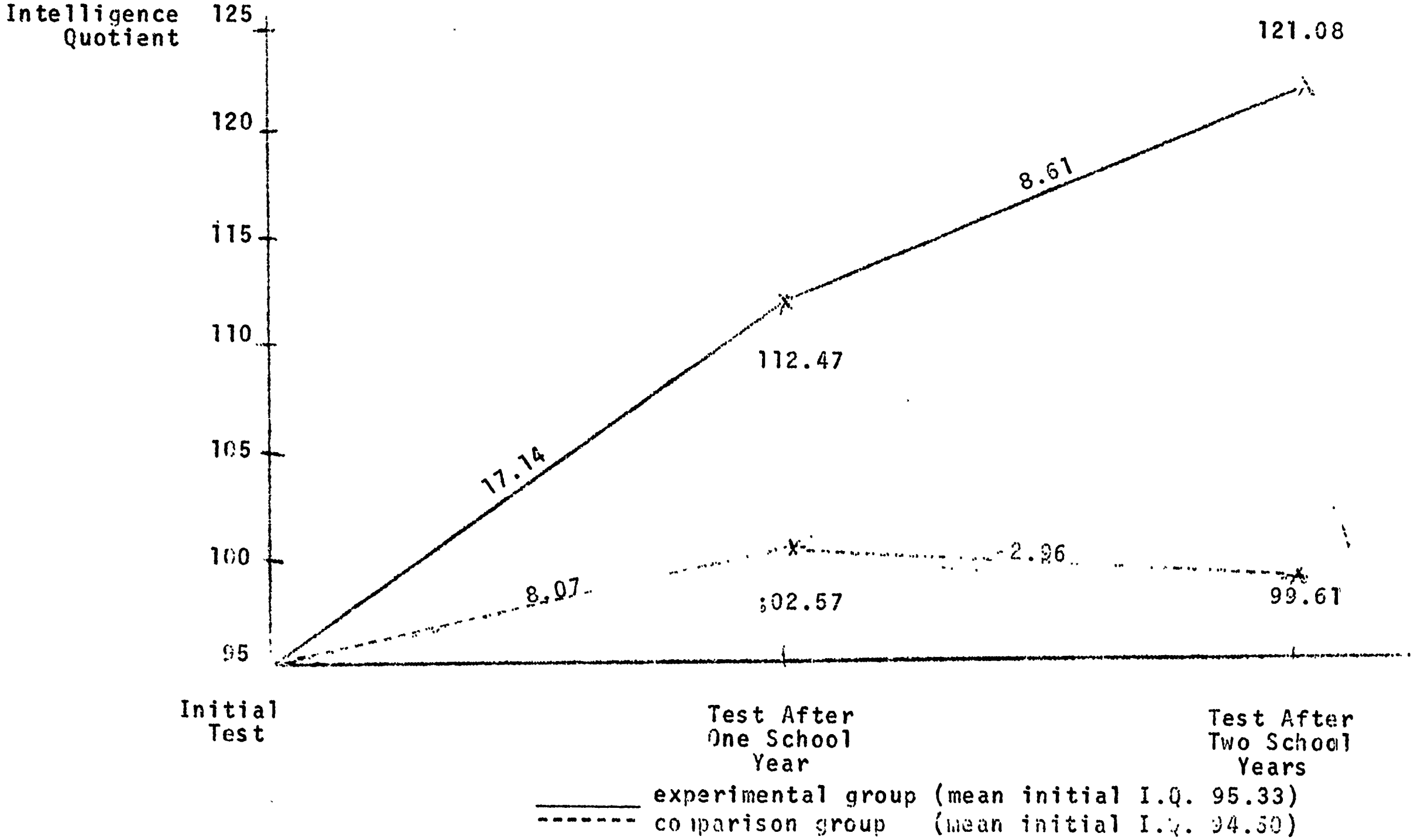

Table 2

Stanford Binet IQ Performance of Experimental Subjects After One and Two Years of Training

Subject*	Entering IQ	IQ After One Year	First Year Gain	IQ After Two Years	Second Year Gain	Total Gain
MA	92	113	+21	123	+10	+31
TA	93	94	+1	103	+9	+10
TB	105	112	+7	121	+9	+16
MB	89	101	+12	131	+30	+42
(DB)	(82)	(112)	(+30)	---	---	(+30)
RC	99	116	+17	119	+3	+20
MC	86	105	+19	112	+7	+26
(NC)	(70)	(89)	(+19)	---	---	(+19)
BG	119	130	+11	139	+9	+20
BP	90	107	+17	112	+5	+32
SV	85	101	+16	108	+7	+23
RV	109	127	+18	138	+11	+29
DD	99	118	+19	129	+11	+30
DW	101	123	+22	118	-5	+17
(BW)	(111)	(139)	(+28)	---	---	(+28)
$\bar{X}$ Total	95.33	112.47	17.14	---	---	24.20
$\bar{X}$ One Year Subjects	87.66	113.33	25.67	---	---	25.67
$\bar{X}$ Two Year Subjects	97.25	112.25	15.00	121.08	8.83	23.83

* one-year subjects in parentheses

Table 3
IQ Performance of Disadvantaged Comparison Subjects

Subject	Entering IQ	IQ After Two Years Training	Change
AB	94	115	+21
AC	118	115	-3
AD	83	94	+11
BA	90	92	+2
BB	88	74	-14
BC	76	93	+17
BD	92	90	-2
CR	101	87	-14
CS	82	95	+13
DB	85	100	+15
BC	79	83	+4
DF	107	97	-10
DJ	113	114	+1
DK	107	120	+13
EA	97	109	+12
EE	97	88	-9
EM	89	94	+5
EP	93	93	0
MA	92	107	+15
MB	88	87	-1
MC	79	87	+8
MR	93	89	-4
NB	94	104	+10
NS	91	106	+15
NT	101	109	+8
PA	109	127	+18
PB	111	117	+6
PR	97	103	+6
$\bar{X}$	94.50	99.61	5.11

Only 12 of the 28 control subjects scored higher than 103, the score of the lowest IQ performer in the experimental group. Eight control subjects had overall IQ losses compared to no IQ losses for the experimental group. The highest IQ gain for the control group was 21 points, whereas the mean gain for the experimental group was 24 points.

Achievement Performance of Experimental Disadvantaged Subjects

Table 4 shows the achievement performance in reading, arithmetic, and spelling of the 12 subjects who finished two years of the experimental program. The mean reading achievement was grade level 2.60 with a range of 1.6 - 3.7. The mean arithmetic performance was 2.51 with a range of 1.4 - 3.3. The mean spelling performance was 1.87 with a range of 1.0 - 2.3. As Table 4 indicates, the correspondence between IQ scores and achievement scores is not perfect. Subject MC had the second highest reading achievement score and the highest spelling achievement score; yet, he had an IQ of only 112. Similarly, subject TB had achievement scores of 3.1, 3.3, and 2.2 in reading, arithmetic, and spelling; however, TB's IQ was only "average" for the group--121.

The Middle-Class Subjects

Table 5 summarizes the performance of the middle-class experimental subjects. After the end of the first year of instruction, the mean achievements of the middle-class subjects in reading and spelling had nearly reached the level that was achieved by the disadvantaged subjects after two years of instruction. The middle-class children had achieved a mean grade level of 2.43 in reading and 1.72 in spelling (compared to 2.60 and 1.87 for the disadvantaged children after two years of instruc-

tion). At the end of the first year, the achievements of the seven children who continued in the program for two years was below the mean of those who did not continue for a second year in all achievement areas, but most noticeably in reading achievement. The mean reading achievement for the continuing children was 2.03 (compared to 2.68 for the one-year subjects), however, during the second year, continuing subjects progressed a full year and a half in reading achievement, terminating the program with a mean reading achievement score of 3.41 (eight tenths of a year above the mean of the disadvantaged children).

Table 6 shows the achievement scores of the middle-class comparison children after they had two years of instruction (having finished pre-kindergarten). The mean grade levels of achievement for the Montessori-trained children in reading and arithmetic (1.04 and 1.21) were well below the means of the middle-class experimental children after one year of Bereiter-Engelmann training (2.43 and 1.46). Significantly the Montessori-trained children did not "burst into reading."

Discussion

Performance of the Disadvantaged Children

The performance difference between the experimental and control disadvantaged children is most economically explained as a function of different training. The experimental children were taught new skills at a much higher rate than the children in the comparison program. The children in the comparison group were taught at a rate only slightly higher than the rate at which they would have been taught if they had not attended the preschool-kindergarten program. The experimental children, on the other

Table 4

Achievement of Disadvantaged Experimental Subjects After Two Years of Instruction

Subject	IQ.	Grade Level on Wide-Range-Achievement Test: Reading	Arithmetic	Spelling
MA	123	2.7	2.2	1.8
TA	103	1.6	2.3	1.7
TB	121	3.1	3.3	2.2
MB	131	3.7	3.1	2.1
RC	119	2.7	2.9	2.0
MC	112	3.6	2.5	2.3
BG	139	3.1	3.3	2.1
BP	112	1.6	1.4	1.0
SV	108	2.0	2.2	1.7
RV	138	3.1	2.7	2.0
DD	129	1.7	2.2	1.9
DW	118	2.3	2.0	1.6
	121.08	2.60	2.51	1.87

Table 5

Achievement Scores and IQ's of Advantaged Subjects After One and Two Years of Instruction

Subject*	First Year Achievement on Wide Range Read.	Arith.	Spell.	Second Year Achievement on Wide Range Read.	Gain	Arith.	Gain	Spell.	Gain	IQ Stanford Binet
*MC	2.0	1.4	1.8							
M	3.5	2.0	2.0							
G	1.4	1.2	1.0	3.3	+1.9	2.2	+1.0	2.2	+1.2	113
H	2.0	1.2	1.9							
H	2.7	1.4	1.8							
H	2.7	1.2	1.9	3.9	+1.2	3.9	+2.7	2.3	+1.4	125
H	1.7	1.6	1.6	3.0	+1.4	2.9	+1.3	1.9	+.3	118
SK	2.7	1.2	1.9							
VK	3.4	2.0	2.1							
JL	1.8	1.4	1.5	3.4	+1.6	2.7	+1.3	1.8	+.3	121
KM	2.0	1.5	1.6							
BO	2.6	1.4	2.2							
CP	1.9	1.4	1.5	2.9	+1.0	3.1	+1.7	2.1	+.6	140
MP	2.2	1.4	1.8							
GS	1.7	1.4	1.2	3.5	+1.8	2.5	+1.1	2.0	+.8	110
KT	2.7	1.5	1.8							
T	3.0	1.4	2.1	3.9	+0.9	3.1	+1.7	2.1	--	137
SW	3.7	1.6	1.3							
M of two yr. sub	2.03	1.37	1.54	3.41	+1.40	2.91	+1.54	2.06	+.66	123.43
Mof one yr. sub	2.68	1.51	1.84							
M of Total	2.43	1.46	1.72							

Table 6

Performance of Middle-Class Comparison Five-Year-Olds on Wide-Range-Achievement Test After Two Years of Instruction

Test, May 1966

Subject	Reading	Arithmetic
DA	1.1	.7
SA	2.6	2.3
JD	.9	1.2
KD	.3	1.4
CE	1.3	1.0
CG	.5	1.0
MH	1.8	1.6
FJ	1.5	1.2
MK	1.3	1.4
EL	1.2	1.5
RM	1.2	1.5
JP	0	.3
LS	.9	1.2
AS	1.3	1.4
DV	.9	1.1
MV	.7	1.1
MW	.3	.6
$\bar{X}$	1.04	1.21

hand, were taught at a rate substantially higher than they would have been taught if they had not been enrolled in the program.

There is a tendency in evaluating the **effectiveness of** instructional programs to look at the long-range effects of the program. While such effects are relevant, they are not of primary concern. The primary issue is: can a program meet the educational objectives to which it addresses itself? In the case of the present experiment, can the program teach disadvantaged preschool and kindergarten children basic skills in reading, arithmetic, and the logical use of language? The IQ scores of the children reflects the effectiveness of the language program. The achievement scores in reading, arithmetic, and spelling indicate the effectiveness of the arithmetic and reading programs. Not one experimental child scored below 100 in IQ after two years of instruction (compared with 14 children in the comparison group who scored below 100). Not one experimental child scored below 1.5 grade level in reading or below 1.4 grade level in arithmetic. In other words, there were no instructional failures. All of the children were taught. The mean performance in arithmetic and reading indicates that the experimental subjects, after finishing their kindergarten year, performed as well as "average" disadvantaged children two or three years older. Mean achievement scores of 2.5 in reading and arithmetic are not unusual for fourth grade disadvantaged children. If these children can be accelerated by 3 years (as the present experiment indicates), the general failure in the public schools is not necessarily a result of the children's innate inferiority or lack of aptitude. It is a function of inadequate instruction.

Middle-Class Children

At the end of the first year of reading instruction, the advantaged children performed on the 2.43 grade level, which means that they had progressed nearly a year and a half during the first year. Those children who continued for a second year in the program had progressed one year (achieving a mean reading score of 2.03 at the end of the first year). During the second year, however, the children who continued gained nearly a year and a half in reading. These children, in other words, were progressing at a faster rate than older children in the public schools.

By the end of the second year, two disadvantaged children scored above grade 3.4 in reading, the mean of the middle-class children, and interestingly, both of these children were Negroes who entered with IQ's in the 80's (MB and MC). Four disadvantaged children scored on or above the middle-class mean in arithmetic. By the end of the second year, there were disadvantaged children in the top-performing study group and there were middle-class children in the B and C groups.

The middle-class children did not have to be taught many of the sub-skills that had to be programmed for the disadvantaged children, especially in reading. For example, the middle-class children did not have to be taught how to blend the letters of a word. The disadvantaged children required a great deal of practice in this skill. By the end of the second year, the advantaged children were almost a full year ahead of the disadvantaged children in reading, although the disadvantaged children made more than one year's progress during the second

year.

Since the performance of the experimental subjects was achieved with only two hours a day of instruction, the amount of time devoted to the various academic areas during the two-year period was probably less then the amount of time devoted to those subjects in school. The reading performance of the middle-class and disadvantaged children was achieved with only about 96 hours of classroom instruction. The amount of time devoted to reading in the regular school program during the first two years of instruction is probably 3-6 times greater. It seems evident, in terms of the performance of children, that the public schools do not utilize their available time to good advantage.

The performance of the experimental children may be viewed as an example of the "hawthorn" effect. However, in the program there was very little interaction with the parents and correspondingly little attempt to change the patterns of behavior in the home. There was a total of three parent meetings over a two-year period. During these meetings, the staff members emphasized the good performance of the children and tried to persuade the parents that their children were smart. Beyond this, however, nothing was done to change the conditions which affected the outside-school learning of the children. The changes that took place in these children were changes that resulted primarily from the experimental treatment in the classroom.

The Effects of "Pressure" on Younger Children

One of the traditional encumberances to early formal education is the belief that the pressure resulting from such instruction will developmentally malform the children. While it is

difficult to evaluate the effects of the present program on the children's personality, interviews with parents and observations of the children disclosed no ill effect. In the program there were virtually no tantrums or behavior problems beyond the second week, although at least two of the disadvantaged children were considered emotionally disturbed. The children participated, and they seemed to enjoy participation. All children engaged in the music period. All complied with the rules--but not as automatons. If the program failed in any respect, it did not adequately prepare the children for the kind of behavior-for-behavior-sake rules which they would encounter in school. During free time or semi-structured activities, the children talked freely to each other. They made observations and asked questions. When given the slightest opportunity, they would relate personal experiences and engage in conversations that were sophisticated for four and five-year-old children. In short, they showed no engrams from the "pressure" of the program. They worked hard; but the parents noted no regressive behavior, bed wetting, thumb sucking, nightmares, etc. In fact, if the parents reports are to be taken seriously, the children had fewer emotional problems than any sample of "unpressured" children.

Perhaps the most noticeable characteristic of the children after two years of instruction was their confidence. The easiest way for the teacher to capture their interest was to announce a difficult task. "This is so hard I shouldn't even be giving it to little kids like you. You'll never be able to do it." The children would respond to this type of challenge by insisting "We can do it! You'll see." Their confidence had been program

med through fooler games in which the children proved to be "smarter" than the teacher. The children exhibited confidence because they had received many demonstrations that they were competent and could succeed in challenging situations. They had surprised--even crushed--the teacher with their smartness. This is not to say that the children would be confident in all situations or even all instructional situations. But they had firm and realistically based confidence about their capacity to perform in new-learning situations.

Summary

A group of disadvantaged four-year-old and a group of middle-class four-year-old children were taught intensively in the Bereiter-Engelmann program for two years (the preschool and kindergarten years). The group of disadvantaged children was comparable in IQ and race-sex composition to a group of 28 children assigned to a traditional nursery-school and kindergarten program. The middle-class children were roughly comparable to a group of Montessori trained four-year-olds. The major hypothesis tested by the program was that children are taught at different rates; if the effective rate at which disadvantaged and middle-class children are taught is increased substantially, these children will perform at an above-normal level, which means that the disadvantaged subjects may become "superior" in specific areas of achievement.

The hypothesis was confirmed. The disadvantaged children in the comparison group showed no particular advantage over children in similar compensatory programs, such as Headstart programs. The program failed to bring half of the children up

to an IQ of 100. The mean for the group was 99.6. The experimental program, however, brought the IQ's of every child to above 100. The mean IQ after two years of instruction was 121, with a range from 103 to 139. The mean achievements of the experimental group were: reading, 2.6; arithmetic, 2.5; and spelling, 1.9. The scores are what one would expect from 8-10 year old disadvantaged children: the experimental subjects, however, were six years old at the end of the program.

After one year of instruction, the middle-class subjects had achievement scores of 2.4 in reading, 1.5 in arithmetic, and 1.7 in spelling. The comparison group did not score as well in any of these achievement areas, although the comparison children had been in a Montessori program for two years. By the end of the second year, those middle-class children who continued in the program scored 3.4 in reading, 2.9 in arithmetic, and 2.1 in spelling. The mean IQ of the group after the second year was 123, only several IQ points higher than the mean IQ of the disadvantaged experimental children.

The present experiments seem to indicate, rather strongly, that the reason disadvantaged children fail in public schools is not necessarily that they are "developmentally impaired" but that they receive poor instruction. If younger children with initially low mental ages can achieve at an above-normal rate, school-age disadvantaged children (who usually learn more rapidly) should be able to achieve at the rate of normal children in specific achievement areas.