DOCUMENT RESUME

ED 139 520 PS 009 278

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TITLE Montessori and Responsive Environment Models: A Longitudinal Study of Two Preschool Programs, Phase Two.
PUB DATE Apr 77
NOTE 45p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, New York, April 4-8, 1977)

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS *Academic Achievement; Achievement Tests; Comparative Analysis; *Disadvantaged Youth; *Early Childhood Education; Early Experience; Economically Disadvantaged; Infants; *Intellectual Development; Intelligence Tests; Intervention; Longitudinal Studies; Preschool Children; Preschool Programs; *Program Evaluation; Public Schools; Readiness
IDENTIFIERS *Montessori Preschools; *Responsive Environment Model

ABSTRACT

This study represents a continuation of a longitudinal assessment of the effectiveness of a Montessori and Responsive Environment preschool program sponsored by the Arlington Public Schools. The Metropolitan Readiness Test, the Caldwell Cooperative Preschool Inventory, and the Peabody Picture Vocabulary Test were used to assess the academic achievement and intellectual development of 3-, 4-, and 5-year-old children with the Montessori or Responsive Environment experiences and those with no preschool experience at the end of the regular kindergarten program. The SRA Achievement Series, Grade 1, was used to assess the achievement of children, with and without the Montessori experience, at the end of first grade. Results indicated that children in the regular 5-year-old kindergarten program with prior Montessori experience scored significantly higher on the Caldwell measure than did children without this experience upon entrance into the program. When all of the children with either type of preschool experience were categorized as one treatment group, results showed that these children scored higher on the Caldwell measure at the beginning and end of the 5-year-old program than those without the experience. Significant differences in favor of the preschool treatment group were also noted on the pretest of the Caldwell subtests: Personal-Social, Associative, Vocabulary, and Concept Activation-Numerical. It was concluded that early educational preschool experiences can be effective in fostering the academic achievement and maintaining the intellectual development of children. (Author/JMB)

Montessori and Responsive Environment Models: A Longitudinal Study of Two Preschool Programs

Phase Two

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ABSTRACT

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A Longitudinal Study of Two Preschool Programs
Phase II

The purpose of this study was to continue a longitudinal assessment of the effectiveness of a Montessori and Responsive Environment preschool program sponsored by the Arlington Public Schools. Aware of the importance of early educational experiences, especially for children from minority or economically deprived backgrounds, the Arlington Public Schools have made preschool experiences available for 2,3,4 and 5 year old children since 1971. A Montessori program was begun in the Fall of 1971. There are currently 21 Montessori classes located in 4 different schools. The Arlington Schools initiated a Responsive Environment preschool program during the Fall of 1973. There are now 2 Responsive Environment classes in 1 school.

As a common goal of both preschool programs is to enhance the intellectual development and academic achievement of children who participate in them, an examination of the immediate and long range effectiveness of these programs to affect the intelligence and academic achievement of children who participate in them was begun in the Fall of 1974. Phase I of the evaluation indicated that both preschool programs foster the general achievement of chidlren and prepare them for school.

Phase II of the evaluation assessed the academic achievement of children with the Montessori or Responsive Environment experiences, and those with no preschool experience at the end of the regular kindergarten program. The Metropolitan Readiness Test was used to assess achievement. The general achievement of children with Montessori experience as 2,3, and 4 year olds who remained in the Montessori 5 year old program, was compared with that of children with no preschool experience, with Montessori or Responsive Environment experiences, upon emtrance and at the end of the 5 year old program. The Caldwell Cooperative Preschool Inventory, and the Peabody Picture Vocabulary Test were used to assess the effectiveness of the preschool experiences. Achievement of first grade children, with and without the Montessori experience, was assessed using the SRA Achievement Series, Grade 1, at the end of the first grade.

The results suggest that early educational preschool experiences can be effective in fostering the academic achievement and maintaining the intellectual developmetn of children. Children with prior Montessori experience in the regular 5 year old kindergarten program, scored significantly higher than did children without this experience upon entrance into the program on the Caldwell. When all of the children with either preschool experience were categorized as 1 treatment group, the results suggest that these children scored higher on the Caldwell at the beginning and the end of the 5 year old program than those without the experience. Significant differences, in favor of the preschool treatment group were also noted on the pretest of the Caldwell subtests, Personal-Social; Associative Vocabulary and Concept Activation-Numerical.

Montessori and Responsive Environment Models: A Longitudinal Study of Two Preschool Programs

Phase Two

The purpose of this study was to continue a longitudinal assess ment of the effectiveness of a Montessori and Responsive Environment preschool program sponsored by the Arlington Public Schools. Aware of the importance of early educational experiences, especially for children from minority or economically deprived backgrounds (Beller, 1973) the Arlington Public Schools have made preschool experiences available for 2, 3, 4 and 5 year old children since 1971.

A Montessori program, based on the theories and methods of Maria Montessori, began with a two class program in the Fall of 1971. This program was initiated in response to concern expressed by the members of the Arlington Public School Board for children from economically disadvantaged backgrounds to have access to early educational experiences.

Currently there are 21 Montessori classes located in 4 different schools. All of the teachers possess certification from the International Montessori Institute, Washington D.C., and are supervised by a Montessori consultant from the Institute.

Another program, the Responsive Environment model, based on the curriculum developed by Glen Nimnicht at the Far West Regional Laboratory, was introduced at one school in the Fall of 1973. The Nimnicht program was begun in response to requests from a parent group for the school board to support an alternative to the Montessori programs. Two classes, located in one school, are now in operation. The teacher of both classes has received training in implementation of the model and is supervised by the coordinator of kindergarten and primary education.

Both the Montessori and Responsive Environment programs are supported by the school board and both operate on a sliding fee scale. Approximately one-half of the total enrollment for each of the preschool programs consists of children from lower socioeconomic backgrounds who pay no fee.

Mixed age grouping, with 2, 3, 4 and 5 year olds together in one class, is common to both programs. The goals of the Montessori program and the Responsive Environment model include facilitating the child's physical, social, emotional and intellectual development.

As a common goal of both preschool programs is to enhance the intellectual development and academic achievement of the children who participate in them, an examination fo the immediate and long range effectiveness

of these programs to affect the intelligence and academic achievement of children was begun in the Fall of 1974. Phase I of the evaluation of the Montessori and Responsive Environment model examined the general, as well as language achievement of the children, readiness for school, parent involvement and attitudes toward the program. Observations of teacher/child behaviors were conducted in both the Montessori and Responsive classrooms in order to describe the educational experiences implemented in each of the programs.

The results of Phase I of the evaluation program indicate that both preschool programs are effective in promoting the general achievement and intellectual development of children. No significant differences between the Montessori and Responsive Environment programs were found on the Caldwell Cooperative Preschool Inventory assessing general achievement,or on the Peabody Picture Vocabulary Test, a measure of intelligence and vocabulary. Children, however, of higher socio economic backgrounds and girls, across both programs, demonstrated significantly higher gains than boys or children from low socio economic backgrounds on the Concept Activation-Sensory subtest of the Caldwell (Seefeldt, 1975).

Differences in teacher and child behaviors were observed between the programs in the categories of teacher

behaviors termed teacher control and nurturance. A greater majority of differences in both teacher and child behaviors, however, appeared to be a function of individual teachers rather than of program.

Parents in both the Montessori and Responsive Environment programs were overwhelmingly supportive of the particular program they were associated with. Over 91% of the parents responding to a questionnaire indicated their support for the program in which their child was enrolled by recommending that the program not only be continued, but expanded to be available for more children and their families.

Phase II of the evaluation of both preschool programs has continued examining the academic achievement and intellectual development of children who had participated in the programs. Academic achievement of children who had attended the Montessori and Responsive Environment programs as preschoolers was examined during their kindergarten and first grade experience. The Metropolitan Readiness Test, Caldwell Cooperative Preschool Inventory, Peabody Picture Vocabulary Test and the SRA Achievement Series were used to assess the achievement and intelligence of children with and without the preschool experiences in kindergarten and first grade.

Related Background Literature

There was a time when the question of whether or not exposure to early educational experiences could have lasting effects on children's intellectual or academic achievement was totally academic. Prior to the 1960's preschool education, in general, was available to only those children of middle class backgrounds whose parents could afford tuition costs. These children , with or without preschool experiences, usually achieved satisfactorily in the school setting. Then too, the stance of psychologists and educators supporting the heredity theory of intelligence made the investigation of the question of the effects of early educational experiences irrelevant (Day & Parker, 1977).

Currently, however, investigation into the effects of preschool education has proliferated the literature (Beller, 1973). Although there is a plethora of studies suggesting that early educational experiences have immediate and positive effects on children's intellectual development (Review of Head Start Research Since 1969, 1977), there are fewer reports describing the long term effectiveness of preschool educational experiences. The importance of exploring the long term effects of preschool education has been pointed out by Sigel & Mc Bane 1969; Hubbard 1967; and Beller 1972. Each reports research documenting achievement gains made by children who had participated in early

educational programs that were not identified until the end of the first, second or third grade.

Because of the unique and intriguing nature of the theories of Maria Montessori a number of studies investigating the effectiveness of Montessori programs to enhance children's intellectual development and academic achievement are available. Assessment of the cognitive or achievement gains of middle class children in Montessori programs, as compared to preschool programs of different models, have led to the conclusions that, at least on the measures utilized to assess cognition and achievement, middle class children with the Montessori experience did not differ significantly from those who had participated in other programs (Miezitis, 1971).

A different pattern emerges when reviewing the literature describing the effectiveness of Montessori experiences to influence the achievement of economically disadvantaged children. On measures of cognitive and academic achievement, economically disadvantaged children with Montessori preschool experience tend to demonstrate greater gains than similar children without the experience (Miezitis, 1971). Several studies are also available indicating that disadvantaged children attending a Montessori program made greater achievement gains than did children

of similar backgrounds in traditional early childhood programs (Berger, 1969; Miller & Dyer ,1977) or those in more highly structured programs (Di Lorenzo, 1970; Karnes, 1969).

Nimnicht, the originator of the Responsive Environment model, reports findings that suggest the program is effective in increasing children's academic and cognitive growth (Nimnicht, 1977). Reports by Nimnicht (1971, 1973, 1977) suggest that children in the program do make significant gains in language growth and academic achievement when compared to those children who had not attended the program. Nimnicht has more recently criticized the concept of looking to early educational experiences to effect intellectual or academic achievement. He states, "it is illogical to speak of compensatory education, or to look to educational programs to foster education, academic growth and achievement. Preschool compensatory education, followed by unimproved public school experiences hardly seems worth the effort" (p. 360, 1977).

Responsive Environment models are in operation in Head Start programs, day care, primary school programs for children in kindergarten through the third grade as well as several Parent/Child Toy Lending Library's across the nation (Nimnicht, 1977). Research on the

effectiveness of the model has consisted of assessing children's language growth, intelligence and academic achievement over periods of time through the use of standardized tests. Preliminary data suggests that the model is one with "good potential for promoting children's cognitive development and self esteem" (Beller, 1973, p.385).

In summary, preschool education is a reality for all segments of society in our nation today. Although research is available demonstrating the potency of early educational experiences to immediately affect the achievement and intellectual development of children, few studies have explored the long term effects of such programs. Many questions about the effectiveness of early educational experiences to affect later academic achievement and intellectual development remain unanswered. This present study will provide additional data on the long term effectiveness of public school preschool programs while exploring the differential effects of the Montessori and Responsive Environment programs.

Methodology

Phase II of the evaluation of the effectiveness of the Montessori preschool program and the Responsive Environment model compared the achievement and intellectual development of kindergarten and first grade children who had

attended one of the programs with those children who had not attended any preschool program. The second phase of this evaluation was designed to answer the following questions:

1. Would children with preschool experience in the Montessori or Responsive Environment model demonstrate greater academic achievement than those who had no preschool experiences at the end of the regular kindergarten program as measured by the Metropolitan Readiness Test?

2. Will there be any difference in the achievement of children who had:

a. participated in the Montessori 2,3, and 4 year old program and who remained in the Montessori 5 year old program;

b. Montessori preschool experience as 2,3, and 4 year olds but who entered the regular 5 year old kindergarten program;

c. experience in the Responsive Environment model as 4 year olds and who entered the regular 5 year old kindergarten program;

d. not participated in any preschool program , as measured by the Caldwell Cooperative Preschool Inventory?

3. Will there be any difference in the intellectual development of the 4 groups of children as measured by the Peabody Picture Vocabulary Test?

4. Would children with the Montessori preschool experience demonstrate greater achievement gains on the SRA Achievement Series, Grade 1 , than those children without this preschool experience?

Figure 1 illustrates the research design for this study.

Sample

Children who have, or were participating in the Montessori and Responsive Environment preschool programs represent a variety of racial, socio economic and cultural backgrounds. Over one-half of the children participating in the Montessori and Responsive Environment programs are from economically disadvantaged backgrounds and pay no fee for the program. In addition, many of the children in these programs speak no English when they enter preschool or speak English as a second language.

Children in the comparison groups, those children without preschool experiences, were selected to represent the total school population of Arlington County. The general achievement level of the schools within the county was examined. From the schools categorized as having the highest achievement levels, two schools were randomly selected. Likewise, two schools were selected from the population of schools with the lowest achievement level

Figure 1

Research Design

Section	N	Preschool Experience	Current School Experience	Dependent Variable
1.		Four Year Olds In	Five Year Olds In	
	15	1. Montessori Pre	.....Reg. Kgn.	Metropolitan Readiness Test
	15	2. Responsive Env	.....Reg. Kgn.	Posttest
	15	3. No Preschool	.....Reg. Kgn.	
2.				Caldwell Cooperative Inventory
	13	1. Montessori Pre	.....Mont. Kgn.	Pre/Posttest
	13	2. Responsive Env.	.....Reg. Kgn.	
3.	15	3. Montessori Pre	.....Reg. Kgn.	PPVT Pre/Posttest
	20	4. No Preschool	.....Reg. Kgn.	
	47	1. Group 1, All Preschool Combined		
	47	2. Group 2, Control, No Preschool		
4.		Five Year Olds In	Six Year Olds In	
	25	1. Montessori Kgn	.....First Grade	SRA Achievement Series Gradel
		2. Reg.Kgn.No Preschool	.....First Grade	Posttest

and two from the total population of schools with average achievement levels. These schools provided the general population from which the various control groups were then randomly selected.

Procedures

A combination of standardized testing procedures were utilized to obtain data for the evaluation. All five year old children in the Arlington schools are administered the Metropolitan Readiness Test in April as a part of the Arlington School's testing program. The classroom teachers administer the test according to the directions given in the manual to groups of children. The scores of the children with and without the Montessori and Responsive preschool experience were obtained from the total list of scores. Scores for those children without the preschool experience were randomly selected from the population of schools comprising the control group.

The Caldwell Cooperative Preschool Inventory and the Peabody Picture Vocabulary Test were individually administered to children with and without the Montessori and Responsive Environment experience. Testers were trained in administration of the test. The test was given on a pre/post paradigm with the pretest administered in October and the posttest in April.

First grade children were identified who had participated in the Montessori program as 2,3, 4 and 5 year olds. These children, along with their classmates, were administered the SRA Achievement Series, Grade 1, Mathematics and Reading subtests, by testers trained to give the test. The control groups, selected from the first grade populations of the schools designated as representing the total population of Arlington County, were likewise administered the SRA Achievement Series. The Series was given in April. The first grade teacher or the Child Development Counselor, assisted the trained tester in the administration of the test.

Instrumentation

Metropolitan Readiness Test

The Metropolitan Readiness Test measures readiness for first grade instruction and has been designed to provide teachers with information that will be helpful in classifying pupils for instruction. The validity of the test is reported for a number of samples and is discussed in terms of relevance of the content and by demonstrating the test's relationship with other measures of school readiness and with success on the test and success in later school achievement.

Reliability data reported for the first grade and kindergarten is reported at .90 at the end of the kindergarten

or grade 1. The test appears to measure those abilities commonly believed to be associated with success in early school learning (Buros, 1972). It was normed on representative samples of beginning first grade children who participated in the cooperative research program of the First Grade Reading Instruction Project.

Caldwell Cooperative Preschool Inventory

The Caldwell Cooperative Preschool Inventory was selected as a measure of children's general achievement in preschool programs. The Inventory explores the child's knowledge of the social world, verbal ability, knowledge of concepts, time sequences, lcoational associations, basic numerical concepts, judgments and knowledge of positional relationships and perceptual development. The authors report reliability of .86 and validity of .48 with the Stanford Binet. The low correlation with the Binet supports Caldwell's contention that the Inventory measures achievement in areas regarded as necessary for success in school, rather than general intelligence and permits educators to demonstrate changes associated with and educational preschool program.

The Inventory consists of 4 subtests; Personal-Social, measuring the child's knowledge of the personal and social world and the ability to get along with and to respond to communications of another person; Associative Vocabulary

assessing the child's ability to demonstrate awareness of the connotation of a word by carrying out some action or by associating it with certain intrinsic qualities of the underlying verbal concpet; Concept Activation-Numerical, the ability to label quantities to make judgments of more or less and to recognize seriated positions and Concept Activation-Sensory, which assesses the child's ability to be aware of certain sensory attributes(shape, size, motion, color) and to be able to execute certain visual motor configurations.

Peabody Picture Vocabulary Test

The Peabody Picture Vocabulary test was used to assess the child's vocabulary achievement and intellectual development. This measure, easily and quickly administered, has often been utilized to determine the effectiveness of preschool programs. Reliability and validity figures from .68 to .93 have been reported.

SRA Achievement Series Grade 1

The SRA Achievement Series Grade 1 was selected to assess the academic achievement in reading and mathematics for children in Grade 1 who had prior Montessori experience and those without this experience. Burors (1972) describes the battery as carefully planned and written with obvious expertise. Reliability, in terms of Kf-20 coefficients, is described as adequate. The subtest scores appear to have high reliability and therefore can be utilized as separate

tests for both individuals and groups. The validity of the SRA is judged as high by Buros (1972) by the fact that it appers to reflect what is taught in the schools.

Data Analysis

Data were analyzed using a number of statistical procedures. Multivariate Analysis of Variance, Analysis of Covariance, with the pretest as the covariate, were the basic procedures utilized.

Results

The results of this study assessing the continuing effectiveness of the Montessori and Responsive Environment preschool programs in Arlington County are presented for each of the research questions.

Question 1

This question asked if children with Montessori or Responsive Environment preschool experiences would demonstrate greater academic achievement as measured by the Metropolitan Readiness Test than those children who had not participated in any preschool program. The Metropolitan, frequently utlized to assess achievement of children in a kindergarten program, as well as to provide teachers with information that will enable them to predict a child's success in the first grade, was administered to all 5 year old children in the Arlington County School system.

Scores on the Metropolitan for three groups of children were identified from the total list of scores. The three groups were 1) those children who had atended the Montessori preschool program as 3 and 4 year olds; 2) those who had attended the Responsive Environment program and 3) children who had not attended any preschool program. A random sample of all of the children without preschool experiences was drawn.

Analysis of Variance was used to analyze the data. Means and standard deviations on the Metropolitan are given in Table 1 for children with and without the preschool experiences.

Table 1

Means and Standard Deviations for Children With Montessori, Responsive Environment and No Preschool Experience

Source	N	Mean	SD
Male Montessori	10	68.10	11.27
Male Responsive	7	68.14	13.83
Male No Preschool	8	74.14	10.43
Female Montesoori	5	77.20	7.91
Female Responsive	6	74.00	14.28
Female No Pre.	8	72.75	11.67

The results of the analysis indicate that there were no significant differences in the achievement of the children in the three different groups as measured by the Metropolitan

Readiness Test. Children with prior Montessori experience as 3, and 4 year olds, and children with Responsive Environment experience at age 4, and those children without any preschool experience did not differ significantly on scores on the Metropolitan Readiness Test (F (1,2)=.174, $p.<.84$). Nor were there any differences in the achievement of boys or girls on the Readiness Test (F (1,1)=1.43,$p.<.24$). Further, there was no interaction between sex of the children and achievement in any of the groups (F (1,2)=.799,$p.<.45$). See Table 2 .

Table 2

Analysis of Variance Summary Table, Readiness Scores for Children With Montessori, Responsive and No Preschool

Source	SS	df	MS	F	p
Sex	199.11	1	199.11	1.43	.24
MRT	48.46	2	24.23	.17	.84
Sex/MRT	221.93	2	110.96	.79	.46

Question 2

The Caldwell Cooperative Preschool Inventory was used to provide data to answer the question whether or not there would be any differences in the general achievement of 5 year old children with: 1) Montessori preschool experience as 3 and 4 year olds who remained in the 5 year old Montessori program; 2) Responsive Environment experience as 3 and 4 year olds

who entered the regular 5 year old kindergarten program; 3) no preschool experience who were now in the regular kindergarten program and 4) Montessori experience as 3 and 4 year olds currently enrolled in the regular kindergarten program.

In order to equalize the number of children in the groups, a random sample of 20 children was drawn from the total of 47 comprising the control group, or those without any preschool experience. The means and standard deviations for the four groupsof children on the pre and posttests of the Caldwell are presented in Table 3 .

Multivariate Analysis of Variance on the posttest scores for the subtests of the Caldwell yielded no significant differences between the four groups (F (12,159)= .149, p.<1.0). Therefore at the end of the 5 year old school program the children in the 4 groups did not differ significantly from one another on posttest scores on the Caldwell subtests.

Using the pretest as the covariate, the data were analyzed with Analysis of Covariance. No significant differences were found between any of the groups of children on the Total Caldwell score (F (3,62)=1.41, p.<.24); or on any of the subtests: Personal-Social (F (3,62)=.156,p.<.92); Associative Vocabulary(F (3,62)=.049, p.<.98);Concept Activation-Sensory(F (3,62)=.351, p.<.78) and Concept Activation-Numerical (F (3,62)=1.51, p.<.21). See Table 4 .

Table 3

Means and Standard Deviations, Caldwell Cooperative Preschool Inventory, Pretest, Four Groups

Group	N	Total		Pers. Soc.		Ass.Voc.		Conc.Num.		Conc.Sen.	
		M	SD	M	SD	M	SD	M	SD	M	SD
1.Mont.to Mont.	19	58.52	12.59	16.73	2.03	10.52	1.80	12.84	1.80	18.42	.96
2.Respon to Reg.Kgn.	13	58.53	8.17	16.46	1.98	11.15	.68	12.53	2.22	17.46	3.04
3. Mont.to Reg. Kng.	15	61.80	3.09	17.66	.81	11.53	.99	13.73	1.33	19.66	.61
4. No Pre.	20	56.70	7.05	16.65	1.04	10.60	1.90	11.40	2.41	18.20	1.10

Means and Standard Deviations, Caldwell Cooperative Preschool Inventory, Posttest, Four Groups

Group	N	Total		Pers. Soc.		Ass.Voc.		Conc.Num.		Conc.Sen.	
		M	SD	M	SD	M	SD	M	SD	M	SD
1.Mont. to Mont.	19	60.15	16.74	17.21	2.11	11.00	2.04	13.42	2.79	18.47	1.74
2. Respon to Reg. Kgn.	13	61.46	3.38	17.30	.52	11.38	.36	13.92	.97	18.76	.54
3. Mont. to Reg. Kgn.	15	62.60	4.15	17.60	.49	11.66	.67	14.53	.57	18.80	.24
4. No Pre.	20	60.15	12.38	17.15	1.30	11.15	.98	13.93	3.64	18.70	.66

Table 4

Analysis of Covariance Summary Table, Caldwell Scores for the Four Groups of Children, Pretest as the Covariate

Source	SS	df	MS	F	p
Total Caldwell	43.56	3/62	14.52	1.41	.24
Pers.-Soc.	.57	3/62	.19	.15	.92
Asso. Voc.	.16	3/62	.05	.04	.98
Con.Act.-Num.	6.09	3/62	2.03	.90	.44
Con.Act.-Sen.	2.60	3/62	.86	1.01	.39

Thus children in the treatment groups , having attended either the Montessori preschool program or the Responsive Environment program in either the 5 year old Montessori or regular kindergarten program, and those children who had not attended any preschool program, did not differ significantly from each other in achievment as measured by the Caldwell Cooperative Preschool Inventory at the end of the 5 year program.

As many believe that the effects of early educational experiences can be most readily identified immediately following the experience, it was of interest to examine the groups' pretest scores on the Caldwell. Analysis of Variance on the total pretest score of the Caldwell for the 4 groups of children indicated that there were differences in achievement at the beginning of the 5 year old school year (F (3,36)=3.56, $p<.01$). Statistical examination of the means with Neuman-Keuls suggest that the children who had Montessori preschool experience who were entering the regular

kindergarten program scored significantly higher than did the children without any preschool experience upon entrance into the 5 year old program.

In order to further assess the effectiveness of the preschool experiences, all of the children with Montessori and Responsive Environment preschool experiences were categorized as 1 treatment group. The complete control group of 47 children without preschool experiences formed the comparison group. Means and standard deviations for the 2 groups are given in Table 5 .

Analysis of Variance on the pretest total score of the Caldwell indicated that there were significant differences in the achievement of the two groups upon entrance into the 5 year old program as measured by the Caldwell (F (1,92)= 14.69, $p.<.10$). Examination of the means indicated that the children categorized as the treatment group, with preschool experiences, scored higher than those children without this experience upon entrance into a 5 year old school program.

Data from each of the subtest scores for the 4 groups of children on the Caldwell were analyzed with Univariate F statistics. Significant differences between the preschool treatment group and the no preschool group were found to exist on the subtests of Personal-Social (F (1,92)=5.09, $p.<.02$); Associative Vocabulary (F (1,92)=6.80, $p.<.01$); Concept Activation-Numerical (F (1,92)=11.00, $p.<.01$).

Table 5

Means and Standard Deviations, Caldwell Cooperative Preschool Inventory, Pretest, Two Groups

Group	N	Total		Pers. Soc.		Ass. Voc.		Conc. Num..		Conc. Sen.	
		M	SD	M	SD	M	SD	M	SD	M	SD
Group I All Preschool Exp. Combined	47	59.57	11.24	16.95	1.75	11.02	1.37	13.04	1.82	18.23	1.77
Group II No Preschool Experience	47	55.85	9.96	16.19	1.52	10.08	2.04	11.68	2.13	17.93	1.22

Means and Standard Deviations, Caldwell Cooperative Preschool Inventory, Posttest, Two Groups

Group	N	Total		Pers.Soc.		Ass. Voc.		Conc. Num.		Conc. Sen.	
		M	SD	M	SD	M	SD	M	SD	M	SD
Group I All Preschool Exp. Combined	47	61.29	11.52	17.36	1.25	11.31	1.36	13.91	1.79	18.66	1.06
Group II No Preschool Experience	47	60.55	9.69	17.27	1.13	11.17	1.14	13.34	2.17	18.74	.70

Examination of the means indicates that the preschool group scored significnatly higher than did those children without the preschool experience on the 3 subtests of the Caldwell upon entrance into a 5 year old program.

Treatment effects were also noted when the data were analyzed with Analysis of Covariance, using the pretest as the covariate. Significant differences were found between the preschool treatment group and the no preschool group on the total Caldwell($F(1,92)=7.14$, $p.<.01$). Examination of the means suggests that the children with the preschool experiences scored higher than did those without this experience at the end of the 5 year old program. Thus children with preschool experiences appeared to maintain the gains in achievement they exhibited at the beginning of the 5 year old program through to the end of the program.

Question 3

Will there be any difference in the intellectual development of the 4 groups of children as measured by the Peabody Picture Vocabulary Test? The Peabody Picture Vocabulary Test, assessing intellectual development through vocabulary, was administered on a pre/posttest paradigm to all selected children in the 4 groups. Means and standard deviations for the sample are given in Table 6.

Data were analyzed with Analysis of Covariance using the pretest as the covariate. No significant differences between the 4 groups were noted ($F(3,62)=1.47$, $p.<.23$) at

Table 6

Means and Standard Deviations, Peabody Picture Vocabulary Test, Pre and Posttest, Four Groups

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
1. Mont. Exp to Mont. Kgn.	19	58.15	4.06	62.94	2.62
2. Respon.Env to Reg. Kgn.	13	61.92	3.27	61.76	3.13
3. Mont. Exp to Reg. Kgn.	15	62.26	5.47	67.00	4.49
4. No Preschool	20	60.20	7.31	64.20	3.64

Table 7

Means and Standard Deviations, Peabody Picture Vocabulary Test, Pre and Posttest, Two Groups

Group	N	Pretest		Posttest	
		Mean	SD	Mean	SD
Group I Combined Preschool Experiences	47	60.51	2.05	63.91	2.52
Group II eschool Exp.	47	57.82	6.50	62.80	3.51

the end of the 5 year old program. The data were also analyzed examining pretest scores only for the 4 groups of children. No significant differences were noted on the pretest scores of the Peabody for the 4 groups of children (F (3,62)=1.37, p.<.25).. Thus children with any of the preschool experiences , or those without, did not differ at the beginning of the 5 year old program, or the end, in intellectual development as measured by the Peabody.

Two groups were formed to further examine the effects of preschool experiences on the intellectual development of children. Group 1 was comprised of all of the children with any preschool experience and Group 2, the total control group of children without any preschool experiences. Means and standard deviations for the 2 groups are given in Table 7.

The pretest Peabody scores for the 2 groups were analyzed with Analysis of Variance. No significant differences between the 2 groups were noted (F (1,92)=2.13, p.<.14). The posttest scores were analyzed with Analysis of Covariance, using the pretest as the covariate. No significant differences were noted (F (1,92)=.365, p.<.54). Thus children did not differ in intellectual development with and without the preschool experiences.

Question 4

The last question asked if children with prior Montessori experience would differ from those without this experience in achievement at the end of Grade 1. The SRA

Achievement Series, Grade 1, Mathematics and Reading subtests, were administered to the selected sample of first grade children with prior Montessori experience and those without. Means and standard deviations for the reading and mathematics subtests of the SRA for children with Montessori experience and those without are found in Table 8. Data were analyzed with Multivariate Analysis of Variance.

No significant treatment effects were noted between children with the Montessori preschool experience and those without (F (1,48)=.497,$p.<.48$) for the reading subtest, or mathematics subtest (F (1,48)=.558, $p.<.45$). Children with and without the Montessori preschool experience appeared to achieve similarily in reading and mathematics as measured by the SRA at the end of Grade 1.

There were, however, school effects noted. The results of the analysis suggest that there were significant differences in the achievement of first grade children in different schools regardless of preschool experience. Both reading achievement (F (4,215)= 15.00, $p.<.01$) and mathematics achievement (F (4,215)= 15.64, $p.<.01$) differed between children in different schools within the county.

Table 8

Means and Standard Deviations, SRA Achievement Series, Grade 1; Reading and Mathematics Subtest With Montessori Preschool and Without.

Group	N	Reading		Mathematics	
		M	SD	M	SD
1. With Mont. Preschool Exp.	25	136.56	72.32	158.72	36.10
2. Without Mont. Preschool Exp.	25	150.56	67.98	149.72	48.96

Summary and Discussion

The results of this study suggest that early educational preschool experiences can be effective in fostering the academic achievement and maintaining intellectual development of children. Children with prior Montessori experience in the regular 5 year old kindergarten program, scored significantly higher than did children without this experience upon entrance into the 5 year old kindergarten program on the Caldwell Cooperative Preschool Inventory. When all of the children with any preschool experiences were categorized as 1 treatment group, the results suggest that these children s red higher on the Caldwell at the beginning and the end of the 5 year old program than those children without the preschool experience. Significant differences, in favor of the preschool treatment group, were also noted on three of the subtests of the Caldwell: Personal-Social, Associative Vocabulary, and Concept Activation-Numerical. Figure 2 presents a summary of the findings.

No other differences between children with and without the preschool experiences were found at the end of the kindergarten or the first grade. Scores on the Metropolitan Readiness Test and the SRA Achievement Series did not differ significantly for children with, or without, the preschool experience. There were, however, significant differences

Figure 2

Summary of Results

Question	N	Preschool Experience	Current School Experience	Variable	Analysis	Results
1		Four Year Olds In	Five Year Olds In			
	15	1. Montessori	Reg. Kgn.	MRT	ANOVA	No Sign.
	15	2. Responsive	Reg. Kgn.			Diff.
	15	3. No Preschool	Reg. Kgn.			
2						
	19	1. Montessori	Mont. Kgn.	CALDWELL	MANOVA	No. Sign.
	13	2. Responsive	Reg. Kgn.			Diff.
	15	3. Montessori	Reg. Kgn.		ANCOVA	No Sign.
	20	4. No Preschool	Reg. Kgn.			Diff.
				CALDWELL/PRE	ANOVA	Mont. to Re
						Sign. Highe
3				PPVT	ANCOVA	No Sign.
						Diff.
	47	1. Group 1, All Preschool Combined		CALDWELL/PRE	ANOVA	Preschool
	47	2. Group 2, Control, No Preschool				Sign Highe
				CALDWELL/PRE SUBTESTS	F	Preschool Sign.Highe
				CALDWELL	ANOCOVA	Preschool Sign.Highe
				PPVT	ANOCOVA	No Sign. Diff.
		Five Year Olds In	Six Year Olds In			
4	25	1. Montessori Kgn.	First Grade	SRA	MANOVA	No Sign.
	25	2. Reg. Kgn. No Pre.....	First Grade			Diff.

found for children in different schools on the SRA Achievement Series.

It could be concluded that the Montessori and the Responsive Environment programs are effectively fulfilling their goals of fostering the academic achievement and intellectual development of young children. The fact that over one-half of the children in the preschool programs are from disadvantaged backgrounds, with many speaking no English upon entrance into the preschool program, should be considered.

It might be postulated that these children would, at the end of the kindergarten or first grade experience, demonstrate lower achievement gains than the general population of children in the Arlington Schools. Nevertheless, the results of the study indicate that not only do these children, following the Montessori or Responsive Environment program score higher on the academic measure of the Caldwell Cooperative Preschool Inventory upon entrance into the kindergarten program and at the end of the kindergarten experience, but that their achievement and intellectual development is maintained through the end of the first grade experience. The early educational experiences received in the preschool programs appear to permit these economically disadvantaged children to compete with their middle class peers in the school setting.

Discussion

Perhaps the question of this study, "are preschool experiences in a Montessori and Responsive Environment program effective in fostering intellectual development and academic achievement?" is not appropriate. Beller (1973) states, "the question of longitudinal impact of early educational programs may represent a serious oversimplification." The complex issues pertaining to the development of intelligence and academic achievemetn have not been addressed in this study. The only variable considered was that of academic achievment or intellectual development. This study did not address child or family characteristics, nor school or teacher characteristics. "If one wants to investigate whether the educational experiences at a certain age has a more or less lasting effect on later development of the individual, then it is necessary to take into account the subsequent experiences of the child which may enhance or interfere with beneficial effects of the early educational experience " (Beller, 1973, p. 547).

Therefore it is recommended that future studies on the longitudinal effectiveness of the Montessori and Responsive Environment programs in Arlington County attempt to consider and control for, such factors as family background, parent involvement, child characteristics, school program and other variables the research literature has identified as

potent influencers of achievement and intelligence.

Variables, such as the social, emotional and physical growth of children should be considered in future evaluations. Growth in these areas are considered important outcomes of educational experiences, further, they are closely related to academic achievement of children and to success in the school situation.

In any longitudinal evaluation, there are a number of problems that must be addressed. The sampling procedures of this study present one very real problem. Each year of the study the number of children with preschool experiences decreases. It may be that an in depth case study approach, carefully documenting and describing the progress of the sample of children with preschool experiences who remain in the school system would be of interest and of value in discussing the effectiveness of an early educational experience.

Instrumentation must also be considered in discussing the results of the evaluation. Although the selected measures are considered valid, it may be that they are not sophisticated enough to identify differences that might exist in the academic achievement and intellectual development of children with and without preschool experiences.

Nimnicht's statement (1973) that it is illogical to look for lasting effects of preschool experiences might also be considered. Nimnicht believes that early

educational experiences, followed by unimproved public school experiences, hardly seem worth the effort. The fact that there were differences between children in different schools might lead to the conclusion that later schooling should be the focus of future evaluations rather than the early preschool experiences.

This evaluation of the Montessori and Responsive Environment models is continuing. Phase III examines the achievement and intellectual development of children with and without the preschool experiences in the second grade. Self concept and social and emotional adjustment of the children with Montessori experience and Responsive Environment experience , will also be assessed.

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