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Longitudinal Effects of Kindergarten

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Abstract. The purpose of this longitudinal study was to determine if the differences in achievement that existed at the end of the 3rd grade among 367 students continued to exist throughout their school years. The students were divided into three groups based on whether they attended public kindergarten, non-public kindergarten, or no kindergarten at all. Indicators of achievement for the three groups were compared using eight dependent variables: number of students taking ACT, composite ACT scores, math ACT scores, English ACT scores, science ACT scores, number of special education placements, cumulative grade point averages, and number of high school graduates. The results indicate that students with kindergarten experience, either public or non-public, scored statistically significantly higher than students without kindergarten experience on composite ACT scores, math ACT scores, English ACT scores, science ACT scores, and cumulative grade point averages. There were no statistically significant differences between the public and non-public kindergarten groups. There were also no statistically significant differences among the three groups in number of students taking the ACT in high school, number of students with special education placements in high school, or number of students graduating from high school.

Current brain research findings are highlighting and drawing much attention to the importance of the early years in a child's life (Lindsey, 1998). In fact, so much attention has been given to brain research that many people have referred to the 1990s as "the decade of the brain." However, the importance of the early years of a child's life is not a new concept. More than some 35 years ago, Benjamin Bloom's *Stability and Change in Human Characteristics* (1964) drew attention to the importance of the environment and early learning for young children. Bloom stated that by age 4, children had achieved 50% of their adult intelligence. The importance of early childhood education was one of the driving forces behind the introduction of Project Head Start (McLoyd, 1998). While current brain research validates Bloom's concept, the impact of early childhood programs continues to be a subject in need of further longitudinal research. The present study examined the longitudinal effects of the first public-supported kindergarten in the state of Mississippi.

Review of Related Literature

Throughout the 1960s and early 1970s, numerous studies examined the effects of early intervention programs on school achievement for poor or disadvantaged children. While programs differed in entry age, the length of intervention, and intervention strategies, most of them examined IQ scores, grade retentions, and special education placements (Lazar, Darlington, Murray, Royce, & Snipper, 1982).

One of the most significant reports of research findings came from the Westinghouse Learning Corporation and Ohio State University study (1969). This study reported that while Head Start participants showed immediate gains in cognitive skills and IQ scores, the effects had disappeared by the time children had

reached the 3rd grade; therefore, it concluded, Head Start projects and similar programs were not beneficial or cost efficient. In rebuttal, the Consortium for Longitudinal Studies was formed (Lazar et al., 1982). The Consortium included the principal investigators of 14 longitudinal studies, and investigated whether the various projects resulted in any lasting gains for the participants. Overall, they found that early childhood education increased IQ scores for participants, but the gains lasted for only 3 years or less. However, Lazar et al. stated that while IQ scores were only predictors of academic achievement, actual achievement records were better evaluation tools. The researchers found that children who were participants in the projects had fewer grade retentions and special education placements. In addition, one of the 14 studies, the Perry Preschool Project, reported many unexpected findings.

The Perry Preschool Project (Weikart, Deloria, Lawser, & Wiegerink, 1970) sought to increase impoverished 3- and 4-year-olds' academic achievement in the later school years, as well as their chances for a meaningful and productive life. Information about participants was collected and analyzed yearly from the ages of 3 to 11, and also at ages 14, 15, 19, and 26 (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Weikart, 1996; Weikart et al., 1970; Weikart, Epstein, Schweinhart, & Bond, 1978). Throughout the school years, the participants had higher achievement test scores, higher grade point averages, fewer failing grades, and lower rates of special education placements. The follow-up study by Weikart (1996) when the participants were 26 found that in addition to higher rates of school achievement, the participants also had fewer arrests and were less in need of welfare assistance, compared to the control group. Moreover, Weikart noted that for every dollar spent on the project, over seven dollars were saved in future spending.

Similar to the Perry Preschool project, the Rome Head Start Study (Monroe & McDonald, 1981) examined whether or not Head Start makes a difference in the academic achievement of poor children. In 1966, a Head Start program was started in Rome, Georgia, to serve 5-year-old children living in poverty. The program consisted of part-time, center-based services from January to August. In a follow-up study on the long-term effects of having attended Head Start, Monroe and McDonald identified all 1st-graders in the Rome City Schools who qualified for federal funds and determined whether or not they attended Head Start by examining their school records. They compared the two groups on percentages of special education placements and percentages of students dropping out of high school. They found that the group that attended Head Start had significantly lower percentages of special education placements (11% vs. 25%) and lower percentages of high school dropouts (50% vs. 67%).

The Early Training Project (Gray, Ramsey, & Klaus, 1982), which began in Murfreesboro, Tennessee, in 1962, studied the achievement of 90 disadvantaged children, ages 3 to 4, in that community. The children were randomly assigned to either the treatment group (half-day, center-based instruction during the summer months until the children started 1st grade) or a control group. Comparisons on measures of school achievement were made when the participants were 18 years old. The treatment group had fewer special education placements, fewer grade retentions, and fewer high school dropouts than the group with no instruction.

The Carolina Abecedarian Project (Ramey & Campbell, 1984) was another early intervention project that sought to increase the academic achievement of children reared in poverty. Ramey and Campbell investigated what effect an early intervention program would have if services were started while the children were still infants. Their study consisted of three experimental groups and one control group. The children in the first of the experimental groups began receiving services while they were infants, and continued to do so through grade 3. Although the second ex-

perimental group received preschool services, the services discontinued when the children started kindergarten. The third experimental group did not receive preschool services, they did, however, receive services from kindergarten through the 3rd grade. The fourth group served as a control, and did not receive either pre- or post–school services. Consequently, the experimental treatment ranged from 3 to 8 years of services. Specifically, Ramey and Campbell investigated whether intense intervention services could prevent children from developing mild mental retardation and risk later school failure. Furthermore, they questioned what degree of services (i.e., duration) would yield the most significant results.

The initial results showed that children with preschool treatment had higher IQ scores from the age of 18 months through the age of 8 years. In addition, Ramey and Campbell (1984, 1991) found that the preschool treatment groups had higher achievement scores than the control group in reading and mathematics, through the 3rd grade. They found that as years of receiving service increased, grade retentions decreased. However, in a follow-up study, when the children were 12 years old, Campbell and Ramey (1994) found that the children who received pre- and post–school interventions had higher rates of special education placements. The investigators surmised that the increase in special education placements may have been the result of advocacy on the part of the school-based resource persons for the children to receive all the help that was available. Nevertheless, Campbell and Ramey concluded from their investigation that if poor children were to succeed academically, "the earlier in the life span education occurs, the greater its benefit is likely to be" (p. 694).

Howard (1986) examined the effects of a public kindergarten on student achievement in the 1st, 2nd, and 3rd grades. The academic achievement of students who attended the public kindergarten was compared to the academic achievement of students who either attended a non-public kindergarten or no kindergarten at all. Howard's study was unique in at least two aspects. First, the study consisted of a control group in which the participants did not have a kindergarten experience. Second, the students of the public kindergarten were a heterogeneous group. There were students from all socioeconomic status groups and, therefore, not just children considered at-risk for school failure. Howard found that public and non-public kindergarten students scored significantly higher on 81% of the subtest scores of the California Achievement Test (CAT) than students who did not have a kindergarten experience. Howard also found that there were no significant differences in achievement between the public and non-public kindergarten groups.

From the review of literature, it has been demonstrated that preschool programs can be effective in increasing achievement for students considered disadvantaged and at-risk for school failure. In fact, the preponderance of studies examining the effects of preschool have concentrated on children under 5 years of age from impoverished backgrounds. However, the literature is relatively void of research in two crucial areas: the effects of preschool attendance on advantaged or middle class children and the effects of kindergarten attendance on later academic achievement. As recently as 10 years ago, kindergarten attendance was mandated in only 39 states (Hildebrand, 1991); today, over 98% of American 5-year-olds attend kindergarten (Forgione, 1998).

Statement of Purpose

Prior research examining the long-term effects of early childhood programs has generally focused on programs attended by children younger than 5 who were considered disadvantaged. The purpose of this study was to determine if the differences in achievement that existed at the end of the 3rd grade among Mississippi students who attended public kindergarten, non-public kindergarten, or no kindergarten

continue to exist throughout their school years. The following hypotheses were used to examine the differences among the three groups.

Hypotheses

1. There will be no significant difference in the number of students taking the ACT among the public, non-public, or no kindergarten groups.
2. There will be no significant difference in composite ACT scores among the three groups.
3. There will be no significant difference in ACT math scores among the three groups.
4. There will be no significant difference in ACT English scores among the three groups.
5. There will be no significant difference in ACT science scores among the three groups.
6. There will be no significant difference in the number of special education placements among the three groups.
7. There will be no significant difference in cumulative GPA among the three groups.
8. There will be no significant difference in high school completion among the three groups.

Need for the Study

By 1948, 76% of the 2,500 public urban elementary schools surveyed by the United States Office of Education had kindergartens. By 1973, 38 of the 50 states offered some form of public kindergarten. It was not until 1978, however, that legislation authorized public kindergartens in the state of Mississippi. This legislation mandated that the funds to operate these kindergartens come from sources other than state monies (Howard, 1986). Four years later, the Mississippi Educational Reform Act of 1982 mandated that each school district begin operating a kindergarten program during the 1986-1987 school year using state funds. Moreover, this legislation contained a clause that stated the act would be repealed in July 1990; if the state of Mississippi were to provide public kindergarten, there would have to be a constitutional amendment. At the time, Mississippi was the only state in America that did not operate a public kindergarten. Consequently, as recently as 10 years ago, the efficacy of early childhood programs, specifically kindergarten, was questioned in the state of Mississippi.

Among the states of the U.S., Mississippi has long ranked near the bottom in terms of student achievement. Consequently, research is needed to identify factors and programs that facilitate student achievement. In addition, the need for the study hinges on two factors of prior research. The first factor is that although many research studies have examined the effects of early childhood programs designed to help students considered disadvantaged or at-risk for school failure, these studies have not focused enough on the effect these programs may have on more advantaged students. Therefore, educators and policymakers must either assume these program effects apply to all students or that the program effects apply only to disadvantaged students. This study alleviates the need for making such assumptions. The participants of the public kindergarten studied here were a heterogeneous group representative of the entire community.

The second factor that necessitates the need for this study is that very few studies look specifically at the effect kindergarten attendance has on later school achievement. This study hopes to fill that void by comparing the achievement of students who went to kindergarten, either public or non-public, to the achievement of students who did not attend kindergarten.

Research Design

The design of this research is prospective causal-comparative. The causal-comparative design attempts to identify a cause-and-effect relationship between the independent variable and the dependent variable by comparing two or more groups that differ on some variable. This design is commonly referred to as an ex-post facto research design, because the condition that is being

studied already exists (Gay, 1996). The prospective causal-comparative design was used because this study sought to determine if a causal relationship existed between kindergarten attendance and school success. The independent variable, which was determined nearly 20 years ago, has three levels: 1) students who attended the Cooperative Demonstration Kindergarten, 2) students who attended non-public kindergarten, and 3) students who did not attend kindergarten. The dependent variables for this study are: 1) number of special education placements, 2) number of high school graduates, 3) number of students taking the ACT, 4) composite ACT scores, 5) math ACT scores, 6) English ACT scores, 7) science ACT scores, and 8) cumulative grade point averages.

Participants

The participants for this study included all students in Howard's (1986) study who have records filed with the Starkville (Mississippi) Municipal School District. Howard's participants included all students who attended 1st grade in the Starkville Municipal School District in the years 1979, 1980, and 1981, and who remained in the district continually through 3rd grade. Originally, there were 134 students in the group with no kindergarten experience, 185 students who attended non-public kindergarten, and 136 students who attended the Cooperative Demonstration Kindergarten (public kindergarten). For this study, 104 students were in the no-kindergarten group, 147 students in the non-public kindergarten group, and 116 students in the public kindergarten group. These figures represent 78%, 79%, and 85%, respectively, of the original participants from each group.

Instrumentation

For the purpose of this study, the ACT, traditionally viewed as a predictor of post-secondary success (Mitchell, 1985), was used as one of the measures of achievement and as an indicator of a student's intention to pursue higher education (Smith, 1995). *The Ninth Mental Measurements Yearbook* (Mitchell, 1985) reported reliability of .90 for the composite score of ACT. The ACT also has reported reliability for each of the subtests: English usage, .92; mathematics usage, .91; social studies, .88; and natural science reasoning, .85. The number of students requiring special education services and the cumulative grade point averages also have been examined in the literature to support the benefits of early childhood education. However, the ultimate indicator of achievement examined in the literature was whether or not the student graduated from high school.

Procedures

The researcher obtained permission from the Institutional Review Board (IRB) of Mississippi State University and Starkville Municipal School District to examine the cumulative records of students in the original study that are currently held by the Starkville Municipal School District. Data from these records were used in the statistical analysis of the data.

Data Analysis

Using the SPSS statistical program, data were analyzed using both descriptive and inferential statistics. Significance of all inferential statistics was at the alpha level of .05. Hypotheses one, six, and eight were analyzed using the chi-square statistical procedure.

The chi-square was used because this data was reported in frequency counts and chi-square is an appropriate statistical test to use when the data under investigation are nominal. Nominal data classifies subjects into mutually exclusive categories; that is either the subject does or does not belong to a certain category (Gay, 1996). Analyses of variance (ANOVAs) were used to test hypotheses two, three, four, five, and seven.

Description of Data

Composite ACT scores, ACT subtest scores of math, English, and science, and grade point averages were considered and analyzed. In addition, this study investigated whether the type of kindergarten experi-

ence (no kindergarten, public kindergarten, or non-public kindergarten) had an effect on students' decision to take the ACT, on students' use of special education services, and on whether students graduated from high school.

The original study consisted of 455 students who attended school in the Starkville Municipal School District (Howard, 1986). In that study, the no-kindergarten experience group had 134 participants, the public kindergarten group had 136 participants, and the non-public kindergarten group had 185 participants. While these same groups were represented in the present study, the authors could locate high school records for only 78% of the original no-kindergarten group, 79% of the original non-public kindergarten group, and 85% of the original public kindergarten group. These percentages yielded an overall percentage of 81%, which corresponds to a total of 367 participants for this study.

As with most longitudinal studies, attrition could have been a serious threat to the validity of this study. Furthermore, the threat of attrition increases as the years involved in the study increase. The overall attrition rate for this study, however, was only 19%. According to Goodrich and St. Pierre (as cited in Gall, Borg, & Gall, 1996), 20% is an appropriate rate for attrition.

Although the study consisted of 367 participants, the group sizes differed depending on the hypothesis being examined. The only hypotheses that included the total group were hypotheses 1, 6, and 8. For hypothesis 7, which examined high school cumulative grade point averages, the total group size was 306 because cumulative GPAs were only recorded for students who graduated. The group size for hypotheses 2, 3, 4, and 5 was 241, which represents the number of study participants who took the ACT.

Results of Analysis

Hypothesis 1

Hypothesis 1 states there will be no significant difference in the number of students taking the ACT among the public, non-public, or no-kindergarten groups. To examine this hypothesis, a chi-square test of independence was conducted on the number of students taking the ACT in each group. Attending public kindergarten, non-public kindergarten, or no kindergarten did not have an effect on whether or not the student took the ACT, $X^2(2, N=367) = 4.91$, $p = .086$. Since the proportion of students taking the ACT did not vary across groups, kindergarten attendance did not appear to have an effect on students' intentions to pursue higher education.

Hypothesis 2

Hypothesis 2 states there will be no significant difference in composite ACT scores among the three groups. This hypothesis was examined using a one-way analysis of variance (ANOVA). The effect for group was significant, $F(2, 238) = 6.54$, $p = .002$ (see Tables 1 and 2).

A Tukey HSD was used to follow up on this effect. The public and non-public kin-

Table 1
Descriptive Statistics for ACT Composite Scores

Group	Mean	Standard Deviation	Group Size
No Kindergarten	18.22	3.93	59
Public Kindergarten	20.65	5.46	81
Non-Public Kindergarten	21.12	5.27	101

Table 2
ANOVA Summary Table: Composite ACT Scores by Kindergarten Group

Variable	Source	Ss	df	Mean squares	F Ratio	F Prop
Composite	Between Groups	332.53	2	166.26	6.54	.0017
	Within Groups	6055.03	238	25.44		

Significance at the .05 level.

dergarten groups scored significantly higher than the no-kindergarten group on composite scores of the ACT. There were no statistically significant differences between the public and non-public kindergarten groups. Therefore, since group differences were found between students who did attend kindergarten (whether public or non-public) and those who did not attend kindergarten, hypothesis 2 was rejected. Students who attended kindergarten, whether public or non-public, achieved higher on the composite ACT scores than students who did not attend kindergarten.

Hypothesis 3

Hypothesis 3 states there will be no significant difference in math ACT scores among the three groups. Table 3 represents descriptive statistics for hypothesis 3. This hypothesis was examined using a one-way ANOVA. The effect for group was significant, $F(2, 238) = 4.75$, $p = .009$ (see Table 4). A Tukey HSD test was used to follow up on this effect. The public kindergarten group and the non-public kindergarten group scored higher than the group with no kindergarten experience. As there were no significant differences between the public kindergarten and non-public kindergarten groups, hypothesis 3 was rejected. Students with a kindergarten experience, whether public or non-public, demonstrated higher levels of math achievement in high school than students without a kindergarten experience. However, whether the student attended a public or non-public kindergarten did not have an effect on high school math achievement.

Hypothesis 4

Hypothesis 4 states there will be no significant difference in English ACT scores among the three groups. A one-way analysis of variance was conducted on English scores. Table 5 represents descriptive statistics for hypothesis 4. The effect for group

Table 3
Descriptive Statistics for ACT Math Scores

Group	Mean	Standard Deviation	Group Size
No Kindergarten	18.34	3.81	59
Public Kindergarten	20.19	5.44	81
Non-public Kindergarten	20.71	4.71	101

Table 4
ANOVA Summary Table: Math ACT Scores by Kindergarten Groups

Variable	Source	Ss	df	Mean squares	F Ratio	F Prop
Math	Between Groups	216.38	2	108.19	4.75	.0095
	Within Groups	5424.1	238	22.79		

Significance at the .05 level.

Table 5
Descriptive Statistics for ACT English Scores

Group	Mean	Standard Deviation	Group Size
No Kindergarten	18.08	5.07	59
Public Kindergarten	20.52	6.37	81
Non-public Kindergarten	21.23	6.31	101

Table 6
ANOVA Summary Table: English ACT Scores by Kindergarten Groups

Variable	Source	Ss	df	Mean squares	F Ratio	F Prop
English	Between Groups	378.78	2	189.39	5.16	.0064
	Within Groups	8728.56	238	36.67		

Significance at the .05 level.

was significant, $F(2, 238) = 5.16, p = .006$ (see Table 6). A Tukey HSD test was used to follow up on this effect. The public and non-public kindergarten groups scored higher on the English subtest of the ACT than the group with no kindergarten experience. There were no differences between the public and non-public groups. Hypothesis 4 was rejected. Students with a kindergarten experience, whether public or non-public, acquired higher levels of English achievement in high school than students without a kindergarten experience. However, whether the student attended a public or non-public kindergarten did not affect high school English achievement.

Hypothesis 5

Hypothesis 5 states there will be no significant difference in science ACT scores among the three groups. A one-way analysis of variance was conducted on science scores. Table 7 represents the descriptive statistics for hypothesis 5. The effect for group was significant, $F(2, 238) = 5.97, p = .003$ (see Table 8). A Tukey HSD test was used to follow up on this effect. The public and the non-public kindergarten groups scored higher on the science subtest of the ACT than the group with no kindergarten experience. There was no significant difference between the public and the non-public kindergarten groups. However, since differences were found between the groups with kindergarten experience and the group without kindergarten experience, hypothesis five was rejected. Students with a kindergarten experience, whether that experience was public or non-public, acquired higher levels of science achievement while in high school than students without a kindergarten experience.

Hypothesis 6

Hypothesis 6 states there will be no significant difference in the number of special education placements among the three groups. A chi-square test of independence

Table 7
Descriptive Statistics for ACT Science Scores

Group	Mean	Standard Deviation	Group Size
No Kindergarten	18.24	3.30	59
Public Kindergarten	20.27	5.11	81
Non-public Kindergarten	20.84	4.97	101

Table 8
ANOVA Summary Table: Science ACT Scores by Kindergarten Groups

Variable	Source	Ss	df	Mean squares	F Ratio	F Prop
Science	Between Groups	260.79	2	130.40	5.97	.0029
	Within Groups	5197.17	238	21.82		

Significance at the .05 level.

Table 9
Descriptive Statistics for Special Education Placements

Group	Total group	Number (%) receiving special education services	Number (%) not receiving special education services
No Kindergarten	104	1 (1%)	103 (99%)
Public Kindergarten	116	2 (2%)	114 (98%)
Non-public Kindergarten	147	4 (2.7%)	143 (97.3%)

Table 10
Chi-Square Test of Significance for Special Education Placements

	Value	DF	Significance
Chi-square	1.04	2	.595

Significance at the .05 level.

was conducted on the number of students receiving special education services. The number and percentage of students in each group with special education placements are reported in Table 9. There was no statistically significant difference found, X^2 (2, N=367) = 1.04, p = .60 (see Table 10). Hypothesis 6 was accepted, therefore, because utilization of special education services was not dependent upon kindergarten type or attendance. That is, the proportion of students with special education placements did not vary across groups.

Hypothesis 7

Hypothesis 7 states there will be no significant difference in cumulative GPAs among the three groups. A one-way ANOVA was conducted on cumulative grade point averages. Descriptive statistics for hypothesis 7 are reported in Table 11. In analyzing the data, the effect group was significant, F(2, 303) = 6.89, p = .001 (see Table 12). A Tukey HSD test was used to follow up on this effect. The public and the non-public kindergarten groups had higher GPAs than students who did not attend kindergarten. Consequently, hypothesis 7 was rejected. There were no significant differences in GPA between the two groups of students who attended kindergarten. Students who attended kindergarten, whether public or non-public, had higher cumulative grade point averages in high school than students who did not attend kindergarten. However, whether a student attended public or non-public kindergarten did not have an effect on the students' cumulative grade point average.

Hypothesis 8

Hypothesis 8 states there will be no significant difference in high school completion among the three groups. A chi-square test of independence was conducted on the number of students graduating in each kindergarten group. The number and percentage of students in each group completing high school are displayed in Table 13. In ana-

Table 11
Descriptive Statistics for Cumulative Grade Point Averages

Group	Mean	Standard Deviation	Group Size
No Kindergarten	2.50	.66	84
Public Kindergarten	2.85	.71	99
Non-public Kindergarten	2.83	.73	123

Table 12
ANOVA Summary Table: Cumulative GPA by Kindergarten Groups

Variable	Source	Ss	df	Mean squares	F Ratio	F Prop
GPA	Between Groups	6.89	2	3.45	6.89	.001
	Within Groups	151.49	303	.50		

Significance at the .05 level.

Table 13
High School Completion

Group	Total group	Number (%) graduating from high school	Number (%) not graduating from high school
No Kindergarten	104	84 (80.8%)	20 (19.2%)
Public Kindergarten	116	99 (85.3%)	17 (14.7%)
Non-public Kindergarten	147	123 (83.7%)	24 (16.3%)

Table 14
Chi-Square Test of Significance for High School Completion

	Value	DF	Significance
Chi-square	.844	2	.656

Significance at the .05 level.

lyzing the data, there was no statistically significant difference found, X^2 (2, N=367) = .84, p = .66 (see Table 14). Attending kindergarten, whether public or non-public, or not attending kindergarten did not seem to have an effect on whether or not the student graduated from high school. Therefore, hypothesis 8 was accepted.

Discussion of Results

Hypothesis 1 examined the number of students taking the ACT. Whether or not the student took the ACT was considered a significant question because taking the ACT served as an indicator of whether the student was considering post-secondary education. Out of the total group of 367, 65.4% of the students took the ACT. The group with the highest percentage of students taking the exam was the public kindergarten group, with 81 out of 116 (69.8%) students taking the test. The non-public kindergarten group of 147 students had 100 (68%) taking the ACT. The no-kindergarten group had the smallest percentage of students taking the exam, with only 59 (56.7%) out of 104 students taking the ACT. Although statistically significant differences were not found at the .05 alpha level, there were differences that approached significance as indicated by probability value of .086. Furthermore, the difference between the percentages of public and the non-public kindergarten groups taking the ACT was only 1.8. However, when both the public and non-public group percentages of students taking the ACT were compared to the percentage of students in the no-kindergarten group, the differences were 13.1 and 11.3, respectively. In which case, it appears that students with kindergarten experience are more likely to seek post-secondary education. These differences, although not statistically significant at the .05 alpha level, are consistent with the findings of Berrueta-Clement et al. (1984). Berrueta-Clement et al. found that students with preschool experience were more likely to attend college or vocational school after leaving high school.

Hypotheses 2, 3, 4, 5, and 7 compared the academic achievement of the students in the public, non-public, and no-kindergarten groups. Hypothesis 2, 3, 4, and 5 examined ACT scores, while hypothesis 7 examined cumulative GPAs. Each of these hypotheses was rejected because significant differences were found among the groups. In each case, both the public and the non-public kindergarten groups scored significantly higher than the no-kindergarten group on the variables selected as measures of academic achievement. These findings were consistent with prior research reported in the literature.

Campbell and Ramey (1994), Ramey and Campbell (1984, 1991), Berrueta-Clement et al. (1984), and Howard (1986) found that students with a preschool experience had higher achievement test scores than students without a preschool experience. Howard's (1986) study is directly related to the current study, in that Howard examined the achievement test scores of the same group of students when they were in the 3rd grade. Consistent with the present study, Howard found that both the public and the non-public kindergarten groups scored statistically significantly higher on achievement tests than did the no-kindergarten group. Howard's findings are also consistent with the current study, in that statistically significant differences between the public and non-public kindergarten groups were not found. Consequently, the continuation of differences between students with a kindergarten experience and those without a kindergarten experience on measures of academic achievement through high school further refutes the notion that the benefits of early childhood education erode over time.

While differences between students with and without kindergarten experience remain constant, the statistically insignificant differences between the two different groups with kindergarten experience fluctuate. This study, unlike Howard's, found that students in the public kindergarten group scored higher, although not statistically significantly higher, than the non-public kindergarten group on the majority of achievement tests. While the non-public

kindergarten group did not score statistically significantly higher than the public kindergarten group on either section of the ACT, the average score for the non-public kindergarten group was higher. The mean GPA of the public kindergarten group was higher, although not statistically significantly higher, than the mean GPA for the non-public kindergarten group. This supports the notion that the small differences found were merely chance occurrences.

Hypothesis 6 examined the number of special education placements. A small number of students (7) in the entire group received special education services, and so differences were difficult to determine. The group with the highest number of students (4 out of 147 students) receiving special education services was the non-public kindergarten group. The non-public kindergarten group was followed by the public kindergarten group with 2 out of 116 students receiving services. The group with the fewest number of students receiving special education services was the no-kindergarten group (1 out of 104 students). This finding did not support the findings of previous research that reported students who attend preschool have fewer special education placements in later grades (Berrueta-Clement et al., 1984; Ramey & Campbell, 1984; Gray, Ramsey, & Klaus, 1982; Lazar et al., 1982; Monroe & McDonald, 1981).

Similar to the statistically insignificant findings of hypothesis 6 were the statistically insignificant findings of hypothesis 8 regarding the number of students graduating in each group. The present study did not support the findings of Berrueta-Clement et al. (1984), Gray et al. (1982), or Monroe and McDonald (1981), which reported students with preschool experience graduated from high school more often than students without preschool experience. Although differences were found and students with kindergarten experience had higher rates of graduation, the differences found were not statistically significant at the .05 alpha level.

The results of the current study suggest that kindergarten attendance neither increases nor decreases the probability of a student graduating from high school, nor the likelihood that a student will need special education services. However, as evidenced by the significant differences found in measures of achievement (ACT scores and cumulative GPAs), kindergarten attendance seems to have an effect on the level of academic achievement.

Conclusions

Despite the increase in the popularity of kindergarten, very little research specifically examines the effects of kindergarten attendance on student achievement. The vast majority of research focuses on programs designed for children 3 or 4 years old who are considered disadvantaged and at-risk of school failure. This body of research has found that children who attend preschool not only achieve at higher levels than similar students who did not attend preschool, but also tend to graduate more often and receive fewer special education placements. There is very little literature that reports the findings concerning the long-term effects of kindergarten attendance by comparing the achievement of students with a kindergarten experience to those without a kindergarten experience. Moreover, the literature is void of research that examines the long-term effects of kindergarten in the state of Mississippi.

Mississippi has had, and continues to have, the dubious distinction of being one of the poorest states in the United States, as evidenced by its bleak economy and dismal student achievement. Consequently, there is a need to identify those programs that facilitate greater student achievement. In an attempt to identify such a program, Howard (1986) examined the achievement scores of 3rd-grade students who had attended kindergarten, both public and non-public, and those who did not attend kindergarten. Howard found that students who attended kindergarten had statistically significantly higher achievement test scores than students who did not attend kindergarten. In determining if those differences persisted throughout high school, the present study tested eight hypotheses.

Based on the findings of the present study, several conclusions were reached. One of the most significant conclusions is that there were no significant differences between the public and non-public kindergarten groups. Therefore, it is concluded that comparisons were ultimately between two groups, those with a kindergarten experience and those without a kindergarten experience. The second significant conclusion of this study is that kindergarten attendance does have an effect on academic achievement. Furthermore, that effect appears to be long-term, as evidenced by the differences in high school achievement test scores between groups.

Similar to when 3rd-grade measures of academic achievement were compared and students with a kindergarten experience scored significantly higher than students without a kindergarten experience, the comparison of high school achievement measures revealed those same differences between students with a kindergarten experience, regardless of type, and those without a kindergarten experience. Consistently, students with kindergarten experience score significantly higher on measures of math, English, science, and overall achievement. These differences in academic achievement transferred to differences in high school cumulative grade point averages (GPAs).

From the analysis of this study, it appears that students who attended kindergarten received higher grades in high school than students who did not attend kindergarten, as evidenced by their GPAs. A logical assumption to make would be that the students who received the higher grades would be more likely to graduate and further their education. However, the findings of this study did not support that assumption, nor did the findings of prior research (Berrueta-Clement et al., 1984; Campbell & Ramey, 1994; Gray et al., 1982; Lazar et al., 1982; Monroe & McDonald, 198).

The results of this study found no difference between students with a kindergarten experience and those without a kindergarten experience in the number of students completing high school or taking the ACT. While the difference between groups in the number of students completing high school did not approach significance, the difference between groups in the number of students taking the ACT did approach significance. Consequently, the conclusion reached from these findings was that further research, with better controls for extraneous variables, is warranted. Although the group that attended the public kindergarten was reported to be a heterogeneous group (Howard, 1986), one important variable—socioeconomic status—was not controlled for or examined with Howard's study or the present study.

The conclusion reached for hypothesis 6, regarding the number of students with special education placements, was that the power of the statistical test to detect differences was insufficient due to the small sample size. Consequently, the ultimate conclusion reached from the analysis of this study was that kindergarten attendance, regardless of type, does have an effect on levels of high school achievement but not on the students' contemplation of post-secondary education, the students' utilization of special education services, or the students' completion of high school.

Recommendations

Based on the findings of the present study, several recommendations are offered. The first recommendation, that further research be conducted, is supported not only by the significant effect of kindergarten attendance on high school achievement, but also by the insignificant findings of kindergarten's effect on students taking the ACT, students' utilizing special education services, and, ultimately, students completing high school.

Further research is needed to determine if differences in high school achievement transfer to greater adult productivity, in terms of self-reliance, occupation, and social status. While high school achievement is important for various reasons, the ultimate success of the school experience can only be measured by the productivity of individuals beyond high school. Second, research needs to be conducted to examine

why higher achievement did not transfer to a higher number of students taking the ACT and graduating from high school, nor to a lower number of students requiring special education services. It is possible, considering the heterogeneous make-up of the groups of this study, that other extraneous variables not controlled for canceled out the effect of kindergarten. If this is the case, then further research is needed to examine the effect of kindergarten on students taking the ACT, graduating from high school, and using special education services, while controlling for extraneous variables such as race, socioeconomic status, family background, and mother's educational background. By controlling for these variables in further research, it is possible that researchers will identify particular characteristics of students who benefited most from their kindergarten experiences and examine ways to improve the kindergarten experiences for those who did not benefit as much. In either case, research should be designed to examine long-term effects. Consequently, the final recommendations are based on the need to conduct longitudinal research.

It is imperative that the Mississippi Department of Education, as well as individual school districts, actively pursue longitudinal research that examines the long-term effects of programs utilized in the state's public schools. In closing, to identify programs that produce lasting effects, longitudinal research must become an integral part and priority of the educational system.

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