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ABSTRACT

The controversy over school segregation and student achievement has drawn heavily on evidence derived from the 1965 Equality of Educational Opportunity Survey (EEOS). This paper tries to remedy the two principal limitations of Coleman et al.'s original analysis of the EEOS data. Since the EEOS was not a longitudinal study, we cannot compare the initial and final achievement of individual students at two points in time. We can, however, compare first and sixth graders in the same elementary schools. We can also compare ninth and twelfth graders in the same high schools. If we assume that the first graders entering a school in 1965 had test scores comparable to the sixth graders' scores when they entered the same school in 1960, we can determine whether the sixth graders' test scores rose or fell relative to national norms in the interval. We can do the same thing at the high school level. Such reanalysis has produced results suggesting that the test performance of students in 51-75 percent of white schools improved relative to national norms between first and sixth grade. This applied to both black and white students in such schools. Black students' performance relative to national norms seemed to decline slightly if they were in 76-100 percent white schools, and to remain constant if they were in 0-50 percent white schools. The racial composition of a high school did not appear to have had any appreciable effect on either black or white students' test scores between ninth and twelfth grades. (Author/JM)

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THE EFFECTS OF DESEGREGATION ON STUDENT ACHIEVEMENT: SOME NEW EVIDENCE FROM THE EQUALITY OF EDUCATIONAL OPPORTUNITY SURVEY

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Abstract: Reanalysis of the 1966 Equality of Educational Opportunity Survey, using a quasi-longitudinal design, suggests that the test performance of students in 51-75 percent white schools improved relative to national norms between 1st and 6th grade. This applied to both black and white students in such schools. Black students' performance relative to national norms seemed to decline slightly if they were in 76-100 percent white schools, and to remain constant if they were in 0-50 percent white schools. The racial composition of a high school did not appear to have had any appreciable effect on either black or white students' test scores between 9th and 12th grades.

THE EFFECTS OF DESEGREGATION ON STUDENT ACHIEVEMENT: SOME NEW EVIDENCE FROM THE EQUALITY OF EDUCATIONAL OPPORTUNITY SURVEY

The controversy over school segregation and student achievement has drawn heavily on evidence derived from the 1965 Equality of Educational Opportunity Survey (EEOS). James Coleman and his colleagues first analyzed the EEOS in 1966 and concluded that "attributes of other students account for far more variation in the achievement of minority group children than do any attributes of school facilities and slightly more than do attributes of staff" (Coleman et. al., 1966, p. 302). This conclusion has been widely cited to support the argument that desegregation will raise black students' achievement. The evidence on which it was based can, however, be criticized on two counts.

(1) Smith (1972) reports that Coleman et. al. inadvertantly transposed a number of variables in their analysis. When Smith substituted the correct variables, the results were more ambiguous.

(2) Coleman et. al. did not control for variations in initial ability among students.[1/] Coleman et. al.'s published correlation matrices indicate that variations in initial ability could easily explain the observed differences in later achievement between students in different sorts of schools.[2/]

Taken together, these two problems might well lead skeptics to reject Coleman et. al.'s original conclusions. Such skepticism might easily be reinforced by recent studies of the short-term effects of busing, which seldom show large changes in the achievement of students who move from predominantly black to predominantly white schools (see St. John, 1971; Armor, 1972; Pettigrew et. al. 1973).

This paper tries to remedy the two principal limitations of Coleman et. al.'s original analysis of the EEOS data. Since the EEOS was not a longitudinal study, we cannot compare the initial and final achievement of individual students at two points in time. We can, however, compare 1st and 6th graders in the same elementary schools. We can also compare 9th and 12th graders in the same high schools. If we assume that the 1st graders entering a school in 1965 had test scores comparable to the 6th graders' scores when they entered the same school in 1960, we can determine whether the 6th graders' test scores rose or fell relative to national norms in the interval. We can do the same thing at the high school level.

The Elementary School Data

Virtually all the racially mixed elementary schools in the EEOS were in Standard Metropolitan Statistical Areas of 50,000 or more and were in the North. 359 of these Northern metropolitan schools returned both 1st and 6th grade data to the EEOS. We will deal only with these schools. The nature and limitations of this sample have been described extensively elsewhere (see Coleman et. al., 1966, Chapter 9, and Jencks, 1972).

The EEOS administered two tests to 1st graders, one of which was "verbal" and one of which was "non-verbal." The KR-20 reliability of the Verbal test was 0.73 for Northern metropolitan blacks and 0.60 for Northern metropolitan whites. The low reliability for whites was apparently due to ceiling effects. The KR-20 reliability of the Non-Verbal test was 0.91 for both blacks and whites.

We will therefore rely primarily on the Non-Verbal test to estimate the cognitive skills of 1st graders entering various kinds of schools, although we will also report 1st grade Verbal scores.[3/]

The EEOS administered four tests to 6th graders, covering "verbal" and "non-verbal" abilities, "reading," and "mathematics." The items for these tests were all derived from Educational Testing Service's School and College Ability Tests. ETS reported KR-20 reliabilities of 0.94 for a similar Verbal test, 0.78 for a similar Non-Verbal test, 0.90 for a similar Reading test, and 0.80 for a similar Math test. We did not recalculate these reliabilities for this sample or these specific tests. There was no evidence of ceiling effects on any of these tests. Using these four tests, we constructed an overall index of General Achievement. We assigned each of the four tests a weight proportional to the time it took in the EEOS battery, i.e. 25 minutes for the Verbal test, 16 minutes for the Non-Verbal test, 35 minutes for the Reading test, and 35 minutes for the Math test. The correlations between this General Achievement index and individual scores on the four separate tests averaged 0.87.

To facilitate comparisons between blacks and whites and between our results and those reported by Coleman et. al. (1966), we standardized all test scores using white norms. The mean white score is thus zero on each test. The white standard deviation is 1.000.[4/] The black mean represents the "gap" (measured in white standard deviations) between whites and blacks. This gap would be about 10 percent smaller if the population standard deviation had been used to standardize each test instead of the white standard deviation.

The EEOS racial data on 1st graders came from teachers. 6th graders reported their own race. These reports have reliabilities in excess of 0.90 (Jencks, 1972). 65 percent of 6th graders in our 359 Northern metropolitan schools reported that they were white, 23 percent reported that they were Negro, and 12 percent reported that they were American Indian, Oriental, Mexican American, Puerto-Rican, Other, or failed to answer the question. Teachers in these same schools reported that 61 percent of 1st graders were white, 29 percent were Negro, and 10 percent were "other." The difference between 1st and 6th graders was consistent with population trends in Northern metropolitan schools during the early 1960's. For analytic purposes, we have used teacher reports to classify individual 1st graders, student reports to classify 6th graders, and aggregated 6th grade student reports to classify schools. (The percentage of whites in 6th grade, estimated from self-reports, correlated 0.93 with the percentage of whites in 1st grade, estimated from teacher reports.)

The Elementary School Results

Table 1 shows the basic results of the elementary school analysis. The mean difference between blacks and whites was 1.029 standard deviations on the 1st grade Non-Verbal test and 1.002 standard deviations on 6th grade General Achievement. The gap was slightly greater for the Verbal test and slightly less for Reading.

Table 1 also contrasts schools with different percentages of white students. White 1st graders' scores have an almost linear

relationship to the proportion of non-white students in the school: the more non-whites, the lower the scores of the entering whites. The same pattern recurs among white 6th graders, except that white 6th graders do as well in 51-75 percent white schools as in 76-90 percent white schools.

Black 1st graders entering schools with more than 75 percent white students score much higher than blacks entering schools with less than 75 percent white students. But among blacks entering schools that are less than 75 percent white, those in the 0-25 percent white schools score slightly higher than those in 26-75 percent white schools. By 6th grade, this pattern is almost reversed. Black 6th graders in 51-75 percent white schools do better than blacks in other schools (except for the 45 blacks in 91-100 percent white schools).

The purpose of this paper is not, however, to examine cross-sectional differences between races or schools, but to examine the pattern of change between 1st and 6th grades. These changes are summarized in Table 2. The ersatz "gain" scores in Table 2 are computed directly from Table 1, by subtracting the 1st grade Non-Verbal scores in a given column from each of the 6th grade scores in that column.

Taken at face value, Table 2 suggests that in schools where whites constitute a large majority (i.e. more than 75 percent of all 6th graders), blacks lose ground between 1st and 6th grades relative to white norms. This is true for all four 6th grade tests, regardless of which 1st grade test one uses to estimate initial ability. Where whites constitute a small majority (i.e. 51-75 percent of all 6th graders), blacks improve their position relative to white norms. Again, this is true

for all four 6th grade tests, regardless of which 1st grade test one uses as a baseline. Where non-whites constitute a majority, the position of blacks relative to white norms does not change between 1st and 6th grades.

Whites, like blacks, improve most in schools that are 51-75 percent white. Their improvement seems less marked, however, if one uses the 1st grade Verbal test to estimate initial ability than if one uses the Non-Verbal test. Other sorts of schools have quite uniform effects on whites.

In general, blacks gain more than whites in schools that are 0-75 percent white. Whites gain more than blacks in schools that are 76-90 percent white. There are so few blacks in 91-100 percent white schools that the difference in gain scores is not statistically reliable.

If all non-whites were black, we might conclude that blacks had to reach a "critical mass" of about 25 percent of total enrollment in order to gain ground relative to whites between 1st and 6th grade. But the actual situation is more complex. When we examined the 25-49 percent non-white schools, we found that only half of them were more than 25 percent black. Their remaining students were Puerto-Rican, Mexican-American, Oriental-American, and "Other." When we divided the 25-49 percent non-white schools into those that were more than 25 percent black and those that were less than 25 percent black, we found that blacks gained about the same amount in the former schools as in the latter. In order to make the "critical mass" theory consistent with these data, then, we would have to argue that blacks can be less than 25 percent of total enrollment so long as there is an appreciable

number of other non-whites around too. This theory makes little intuitive sense to us. We conclude that the breakpoints in Tables 1 and 2 should not be taken too literally. In general, blacks gained ground relative to whites in all schools where they were more than 10 percent and less than 75 percent of total enrollment.

We found no significant differences between gains for males and females in these schools, although the black-white gap was consistently a bit smaller for females than for males.

There are several possible explanations for these findings.

(1) Methodological Error. Our analysis assumes that the 6th graders enrolled in a given school in 1965 had had the same initial scores five years earlier as the 1st graders entering the school in 1965. Given rapid changes in the economic and racial composition of some schools, this assumption may appear questionable.

There are two alternative theories about how changes in a school's racial composition come about. According to one theory, departing whites withdraw children in roughly equal numbers from all grades simultaneously. Conversely, arriving blacks enter their children in equal numbers in all grades simultaneously. If this happens, both the ratio of blacks to whites and the socio-economic backgrounds of blacks and whites should be about the same for all grades in any given year, even though they change from one year to the next. Current 1st graders' test scores should also provide a realistic estimate of current 6th graders' scores when they entered the same school.

A second theory holds that changes in a school's racial composition are likely to affect different grades differently. According to this theory, whites whose children have been enrolled in a school with rising

black enrollment may keep them there, but whites with younger children will be reluctant to enter them in a changing school. Conversely, blacks may be most likely to move into a traditionally white neighborhood when their children first reach school age. If they have older children, they may stay in their old neighborhood. If this were the case, the racial composition of 1st grades would change sooner than the racial composition of 6th grades. Not only that, but both blacks and whites entering 1st grade in a changing school might come from lower status families than blacks and whites who had been in the school for some years. If this were the case, both black and white 1st graders would probably have lower test scores than current 6th graders had had when they entered five years earlier. Comparing 6th to 1st graders would therefore produce a spurious pattern of "gains" between 1st and 6th grades, even though there has been no real change.

The EEOS data supports the first rather than the second theory. The schools that seem most likely to be "in transition" from white to black are those in which the 6th grade is 51-75 percent white. Whites constituted 60.2 percent of 1st grade enrollment in these schools, compared to 61.5 percent of 6th grade enrollment. Thus there is no evidence that white 1st grade enrollment declines before white 6th grade enrollment. Nonetheless, we also checked to see whether schools with more non-whites in 1st than in 6th grade were more likely to show "gains" between 1st and 6th grade. Table 3 shows the results of such a comparison. Schools where non-whites are more numerous in 1st than in 6th grade do not differ in any consistent way from schools where the whites were more numerous in 1st than in 6th grade. Thus there is no

reason to suppose that current 1st grade scores yield a biased estimate of current 6th graders' 1st grade scores, even in transitional schools.[5/]

But even if the gain scores in Table 2 provide an unbiased estimate of the change in students' scores between 1st and 6th grades, they may not provide unbiased estimates of the effects of having attended particular types of schools. Psychometricians have spent a generation deploring the use of unadjusted gain scores to measure programs' effects on particular students, and some of their objections may also apply to the present analysis.

For illustrative purposes, consider white 1st graders in 0-25 percent white schools. Their non-verbal scores average 0.676 standard deviations below the mean. What is their probable 6th grade General Achievement, assuming 0-25 percent white schools are no better or worse than other schools? These students do not constitute a random sample of all students whose initial scores were 0.676 standard deviations below the 1st grade mean, so their 6th grade mean cannot simply be predicted from the correlation between 1st and 6th grade scores, even if this were available. The factors which depress these students' 1st grade scores are likely to be economic, social, and cultural. Such factors are likely to influence students' scores throughout elementary school. Their predicted 6th grade mean is therefore likely to be quite close to their 1st grade mean. The 6th grade mean may not be exactly equal to the 1st grade mean, however, even if all schools have uniform effects.

Suppose, for example, that whites entering 0-25 percent white schools have low scores because they come from poor families. But suppose that in the absence of differences between schools, the effect of coming from a poor family diminishes with age. The predicted 6th

grade mean for whites in 0-25 percent white schools would then be appreciably higher than the 1st grade mean. The implied negative effect of attending a 0-25 percent white school would, in turn, be larger than the observed difference between 1st and 6th grade scores shown in Table 2, which is only -0.082 standard deviations. Conversely, if socio-economic differences between families exert more influence on test scores at age 11 than at age 6, the predicted 6th grade mean for whites in 0-25 percent white schools would be lower than the observed 1st grade mean. In that case students in these schools may actually be scoring higher in 6th grade than they would have scored if they had attended an average school.

We doubt that this problem plays a significant role in producing the "gains" and "losses" in Table 2, but we cannot be absolutely sure. The observed correlations between the EEOS family background measures and scores on the EEOS tests vary somewhat from one grade level to another, and the 1st grade correlations tend to be lower than others. We believe, however, that this is because the 1st grade data was unreliable. (It was obtained from teachers, who were supposed to ask children the required questions but often seem to have guessed or omitted the questions entirely.) There is no consistent trend in the correlations between test scores and background factors in higher grades. Nor do we know of any other research in which parental characteristics were reliably measured and in which their correlation with standard 1st grade tests was appreciably different from their correlation with tests later on. In the absence of such evidence, the most reasonable assumption seems to be that both measured and unmeasured background factors have about the same influence on 1st and 6th grade scores. If this is true, the 1st grade mean for schools of a given racial composition con-

stitute as good an estimate as we can currently make of the students' probable 6th grade mean if they were to attend an "average" school. It follows that the change scores in Table 2 are also as good an estimate as we can currently make of the effects of attending one type of school rather than another.[6/]

(2) Sample Bias. Tables 1-3 assign equal weight to every student in the EEOS Northern metropolitan sample. This sample is unrepresentative, both because of deliberate oversampling of some types of schools and because some districts refused to participate. Coleman et. al. (1966, Chapter 9) developed a set of weights designed to make the EEOS sample comparable to the nation as a whole. When we used Coleman et. al.'s weights, we obtained essentially the same results as in Tables 1-3. This suggests, though it does not prove, that sample bias does not account for the observed results.

As a further check, we looked at the specific schools with large black gains between 1st and 6th grades. Of the 37 schools with 51-75 percent white enrollment, for example, blacks showed gains relative to the overall white norm in 24 and losses in 13. The 24 schools showing gains were located in 17 school districts. Those showing large gains were located in Johnstown, Pennsylvania; Milwaukee, Wisconsin; New Haven, Connecticut; New York City; and suburbs of Buffalo, New York, Racine, Sacramento, and San Francisco. There is no apparent reason for discounting results from these districts as unrepresentative.

Nonetheless, no other sample has yielded results precisely comparable to those reported here. [Most studies suggest that blacks do slightly better in predominantly white schools even when they are a small

minority (see St. John, 1971).] The apparently negative results for such schools in this sample should therefore be treated with caution.

(3) Real Change. The foregoing considerations suggest that in these particular Northern metropolitan elementary schools in the period between 1960 and 1965, both blacks and whites in 51-75 percent white schools improved more between 1st and 6th grades than students in other schools. Likewise, the evidence suggests that blacks in schools that were more than 75 percent white improved less between 1st and 6th grades than blacks in other schools. Comparison of predominantly white to predominantly non-white elementary schools in Table 2 suggests that on the average attending a predominantly white elementary school boosted a black student's test scores by 0.215 standard deviations. If all blacks gained this much relative to white norms between 1st and 6th grades, the test score gap between blacks and whites would fall by 21 percent.

These differences may not, of course, have been caused by racial composition per se. They may have been caused by the distribution of school resources, by teacher attitudes, by student motivation, or by any factor that was correlated with racial composition in this sample at this time. We can, however, rule out one possibility, namely that the observed differences were entirely due to the socio-economic rather than the racial composition of the schools. The mean socio-economic level of these schools was an almost linear function of the percentage of whites in the 6th grade. If socio-economic composition were the only factor influencing changes between 1st and 6th grades, both blacks and whites should have gained more in 76-90 and 91-100 percent white schools than in 51-75 percent white schools. The reverse being the case, other factors must also have been at work.

The High School Data

Just as at the elementary level, the great majority of racially mixed EEOS high schools were in Northern metropolitan areas. 154 Northern metropolitan high schools returned data on both 9th and 12th graders in the EEOS. We will deal only with these schools.

The EEOS administered five tests to both 9th and 12th graders, covering verbal and non-verbal ability, reading comprehension, mathematical skills, and general information. The items on these tests were derived from ETS's School and College Ability Tests. ETS estimated the mean KR-20 reliability of the tests at 0.84 (Jencks, 1972). After correcting for unreliability, the 1st principal component explained 94.7 percent of the variance in the 9th grade battery and 91.7 percent of the variance in the 12th grade battery. The estimated true correlations of the various tests with the 1st principal component all exceeded 0.93. This suggests that the kind of achievement measured by the five tests was almost one-dimensional. We therefore calculated a single General Achievement score for each student, by summing the number of correct answers the student gave on the five separate tests. The reliability of this General Achievement score was not calculated, but probably exceeds 0.90. Its correlation with the 1st principal component was 0.99.

Racial data were collected from students and appear quite reliable (Jencks, 1972).

The High School Results

Table 4 shows the results of the high school analysis. Both 9th and 12th grade General Achievement scores were standardized to a mean of zero and a standard deviation of 1.00. These standard scores are

not comparable to the elementary school scores in Tables 1 to 3, however, because we used a racially mixed national sample to calculate the 9th and 12th grade standard deviations.[7] The difference between the elementary and secondary school standardization procedures accounts for the fact that the gap between blacks and whites appears smaller in the 9th grade than in the 6th grade.

Table 4 shows that the difference between Northern metropolitan blacks and whites was 0.921 standard deviations in 9th grade and 0.835 standard deviations in 12th grade. This suggests that Northern metropolitan blacks improved their position relative to whites between 9th and 12th grades. This finding may be spurious, however, since blacks who scored below the black mean may have been more likely to drop out between 9th and 12th grades than whites who scored below the white mean.

Table 4 also shows the relationship between high schools' racial composition and changes in General Achievement between 9th and 12th grades. Many of the differences are statistically significant, but none is large enough to be of much pedagogic importance. When schools are classified by the percentage of blacks rather than whites, the differences in gains remain trivial. The finding that secondary school racial mix has less impact on test scores than elementary school racial mix is consistent with other studies (Wilson, 1959; St. John, 1971).

Conclusions

Our results suggest that in the early 1960's racially mixed elementary schools raised both black and white achievement if non-whites were a large minority, but that they depressed black achievement if non-whites were a small minority. Racially mixed secondary schools did not seem to have much effect either way.

The relevance of these findings to the current controversy over busing is uncertain. We have not tried to determine how many of the schools covered by the EEOS were desegregated by court order or by compulsory busing, but it seems safe to assume that the proportion was small. Court ordered busing or changes in attendence zones may produce the same effects as other sorts of desegregation, but we have no direct evidence for this. Such an argument would be especially tenuous if the difference between racially mixed and racially segregated schools in the EEOS sample were really due to factors like teacher attitudes or school resources rather than the student mix per se.

The EEOS data do, however, have one great advantage over most current data on the results of busing. The EEOS schools had almost all been desegregated for some time. This means that the observed "effects" indicate the cumulative impact of desegregated schooling, not the impact for a single year. Most busing studies give data for only one or two years. If the cumulative effect of desegregated elementary schooling were to narrow the test score gap between blacks and whites by 21 percent, for example, the effect for one year might be to reduce the gap by only 0.04 standard deviations. Since most samples in busing studies are quite small, a change of 0.04 standard deviations is seldom statistically significant, even though the

cumulative effect of many such changes is substantial.

Overall, then, while the EEOS is no substitute for long-term longitudinal studies of desegregation, it does provide certain data that cannot be obtained from short-term longitudinal studies. These data suggest that racially balanced elementary schools may have modest positive effects on both black and white test scores.

FOOTNOTES:

1. Coleman et. al. (1966) did control for variations in socio-economic status, but their Supplementary Appendix indicates that the 6 background characteristics they controlled never explained more than 15 percent of the test score variance at any grade level. Controlling socio-economic status is not, then, necessarily equivalent to controlling initial ability.

2. About half of the Northern 9th graders covered by the EEOS were in 4-year high schools. Since testing was conducted in October, these 9th graders had only been enrolled in their present schools for a few weeks. Test score differences between these students could hardly have been caused by the characteristics of their new schools. Yet Coleman et. al. reported substantial test score differences among 9th graders in high schools of varying socio-economic composition, even after they controlled individual race and socio-economic background. This implies that predominantly middle-class high schools enroll students with higher initial scores than predominantly working-class high schools, and that this difference is larger than would be expected simply on the basis of measured socio-economic differences between individuals entering different schools. For whites, the test score differences were as large in 9th grade as in 12th grade. This implies that academic selectivity explains the entire apparent effect of high school socio-economic composition on whites. This inference is supported by the present analysis.

3. Controlling only 1st grade non-verbal scores means we ignore differences in initial ability that are independent of non-verbal ability. This problem is not solved by controlling 1st grade verbal scores, however. When schools' mean 6th grade scores on various tests are regressed on both mean 1st grade verbal score and mean 1st grade non-verbal score, mean 1st grade verbal score is consistently insignificant.
4. The norms for both blacks and whites in this standardization were derived from the 15,754 white 6th graders and the 17,341 white 1st graders in these 359 Northern metropolitan schools, not from a representative national sample.
5. This does not mean we think that the use of current 1st graders to estimate the initial scores of current 6th graders yields an exact estimate for each school. Dyer, Linn, and Patton (1969) have demonstrated that this is unlikely. We argue only that our method should yield an unbiased mean for schools of a given racial composition.
6. Because unmeasured background factors play a part in creating the observed differences between 1st graders in different types of schools, regression analysis would yield biased estimates of school effects, even if longitudinal test score data were available. Regression analysis assumes that if other things are equal, all students will regress the same distance towards the mean between 1st and 6th grade. Unless the between-school variance in initial scores is entirely explained by measured characteristics, a regression model will

imply that schools with low initial means should improve their relative position, while schools with high initial means should lose ground. If a school has a lower initial mean than would be expected on the basis of the students' measured characteristics, and if it has exactly the same mean in 6th grade, this will show up as a negative "school effect." If the low initial mean is really attributable to unmeasured background characteristics of the students entering that school, and if these background characteristics are exerting a continuing influence on test scores, the apparent "school effect" will be spurious.

7. Our use of different procedures to standardize the elementary and secondary school data was dictated by the ready availability of national norms for the high school sample but not the elementary sample. It has no effect on the analysis except as noted in the text.

TABLE 1

MEAN STANDARDIZED SCORES OF BLACKS AND WHITES

IN NORTHERN METROPOLITAN EEOS SCHOOLS,

BY PERCENTAGE OF WHITES IN THE SIXTH GRADE

	PERCENT WHITE IN SIXTH GRADE					
	0-25	26-50	51-75	76-90	91-100	All
WHITES						
1st Grade:						
Verbal	-0.831	-0.574	-0.225	-0.106	0.151	0.000
Non-Verbal	-0.676	-0.472	-0.352	-0.076	0.151	0.000
6th Grade:						
Verbal	-0.978	-0.575	-0.167	-0.123	0.152	0.000
Non-Verbal	-0.584	-0.316	-0.144	-0.112	0.107	0.000
Reading	-0.702	-0.425	-0.076	-0.095	0.104	0.000
Math	-0.736	-0.401	-0.092	-0.117	0.113	0.000
General Achievement	-0.758	-0.436	-0.111	-0.111	0.118	0.000
School N	52	26	41	57	158	334
6th Grade Student N	473	729	1804	2753	9995	15,754
1st Grade Student N	604	891	1846	3380	10,620	17,341
BLACKS						
1st Grade:						
Verbal	-0.973	-1.011	-1.168	-0.577	-0.581	-0.984
Non-Verbal	-1.015	-1.137	-1.154	-0.615	-0.574	-1.029
6th Grade:						
Verbal	-1.223	-1.094	-0.897	-1.066	-0.660	-1.169
Non-Verbal	-0.969	-0.960	-0.814	-0.946	-0.461	-0.949
Reading	-0.844	-0.798	-0.648	-0.884	-0.661	-0.820
Math	-1.133	-1.035	-0.862	-0.990	-0.739	-1.090
General Achievement	-1.039	-0.963	-0.796	-0.968	-0.657	-1.002
School N	77	24	37	28	23	189
6th Grade Student N	4401	625	553	130	45	5,754
1st Grade Student N	6408	801	610	225	47	8,091

Note for Table 1:

Testing the significance of the differences between cells in this table requires some approximation. Our data had already been aggregated by school before we began our work, so within-cell standard deviations were not available. We did, however, have the sums of squares for the 6th grade verbal test using another metric. These showed that the within-cell variances were quite homogeneous for the verbal test. There is no reason to suppose that they would be more heterogeneous for the other tests. If the within-cell variances are approximately equal, they must average just under 1.000. On this assumption, analysis of variance shows that the main effects of both individual race and the racial composition of the school are statistically significant beyond the 0.001 level for all tests at all grade levels. The interactions between individual race and the racial composition of a school are also significant.

TABLE 2

"GAINS" BETWEEN FIRST AND SIXTH GRADE FOR BLACKS AND WHITES IN NORTHERN METROPOLITAN EEOS SCHOOLS, BY PERCENTAGE OF WHITES IN THE SIXTH GRADE

SIXTH GRADE SCORE MINUS 1st NON-VERBAL	PERCENT WHITE IN SIXTH GRADE					
	0-25	26-50	51-75	76-90	91-100	All
WHITES						
Verbal	-0.302	-0.103	0.184	-0.047	0.002	0.000
Non-Verbal	0.093	0.156	0.208	-0.036	-0.043	0.000
Reading	-0.025	0.047	0.276	-0.019	-0.047	0.000
Math	-0.060	0.071	0.260	-0.042	-0.037	0.000
General Achievement	-0.082	0.036	0.240	-0.035	-0.032	0.000
BLACKS						
Verbal	-0.207	0.042	0.257	-0.452	-0.086	-0.140
Non-Verbal	0.046	0.176	0.341	-0.332	0.113	0.080
Reading	0.171	0.338	0.506	-0.269	-0.087	0.210
Math	-0.118	0.102	0.292	-0.376	-0.164	-0.061
General Achievement	-0.023	0.174	0.359	-0.353	-0.082	0.027

Note for Table 2:

For N's, See Table 1. In order to test the significance of differences in this table, we must again use approximation. Since the EEOS was not a longitudinal study, we do not have the within-cell variances of changes in individual scores between 1st and 6th grade. But if we assume a maximum variance of 1.000 for both 1st and 6th grade scores in each cell, and if we follow Bloom (1964) and assume a minimum individual-level correlation between 1st and 6th grade scores of 0.50, the maximum variance of the difference between individuals' 1st and 6th grade scores is $1.000^2 + 1.000^2 - 2(0.50)(1.000)(1.000) = 1.000$.

Using this conservative estimate the effects of an individual's race on his gain in General Achievement is not quite significant. The effects of the individual's race on specific tests are all significant, albeit in opposite directions. The effects of a school's racial composition on changes between 1st and 6th grades are significant at the 0.001 level for both races. For whites, however, only the 51-75 percent white schools have effects that differ significantly from the overall norm. For blacks, virtually all comparisons between types of schools yield statistically significant differences. The interactions between individual race and school racial composition are also statistically significant at the 0.001 level.

TABLE 3

"GAINS" BETWEEN FIRST AND SIXTH GRADE FOR BLACKS IN NORTHERN METROPOLITAN EEOS SCHOOLS, BY PERCENTAGE OF WHITES IN SIXTH GRADE AND TREND IN PERCENTAGE OF NON-WHITES

	PERCENTAGE OF WHITES IN SIXTH GRADE					
	0-25	26-50	51-75	76-90	91-100	All
Percentage of Non-whites Higher in 1st than 6th Grade						
6th Grade General Achievement	-0.987	-0.974	-0.703	-0.905	-0.470	-0.937
Gain	-0.013	0.042	0.398	-0.578	0.004	0.043
N	1535	267	312	39	25	2178
Percentage of Non-whites Lower in 1st than 6th Grade						
6th Grade General Achievement	- 1.066	-0.954	-0.916	-0.995	-0.889	-1.042
Gain	-0.029	0.272	0.308	-0.256	-0.190	0.017
N	2866	358	241	91	20	3576

TABLE 4

MEAN STANDARDIZED SCORES OF BLACKS AND WHITES

IN 154 NORTHERN METROPOLITAN EEOS HIGH SCHOOLS,

BY PERCENTAGE OF WHITES IN THE NINTH GRADE

	PERCENT WHITE IN NINTH GRADE					
	0-25	26-50	51-75	76-90	91-100	All
WHITES						
12th Grade General Achievement	-0.467	-0.218	-0.188	0.069	0.096	0.000
9th Grade General Achievement	-0.480	-0.300	-0.165	0.056	0.114	0.000
GAIN	0.013	0.082	-0.023	0.013	-0.018	0.000
9th Grade Student N	1305	3595	6190	11578	18340	41008
BLACKS						
12th Grade General Achievement	-0.895	-0.828	-0.864	-0.520	-0.509	-0.835
9th Grade General Achievement	-0.962	-0.944	-0.945	-0.680	-0.396	-0.921
GAIN	0.067	0.116	0.081	0.160	-0.113	0.086
9th Grade Student N	6345	3650	2124	1009	277	13405

Note for Table 4:

If one assumes that the maximum within-cell standard deviation is 1.000 and that the minimum correlation of 9th with 12th grade individual scores is 0.50, the maximum standard deviation of individual gains between 9th and 12th grades is again 1.000 (see note for Table 2). Analysis of variance then shows that the main effects of individual race on gains are significant at the 0.001 level. The effects of school racial composition are significant at the 0.05 level for both blacks and whites. The interactions between individual race and school racial composition are also significant at the 0.05 level. (Both 91-100 and 26-50 percent white schools widen the black-white gap more than other schools.)

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