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Mitigating Disadvantage: Effects of Small-Scale Schooling on Student Achievement in Alaska

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Controlling for three domains of background variables (school resources, school climate, and student academic background), this study investigated the hypothesis that school size mediates the effect of disadvantaged status on the achievement of individual students. The group studied included all students in grades 4 (N = 5,589), 6 (N = 3,930), and 8 (N = 4,034) who had continuously attended the same school district for at least four years prior to their participation in the fall 1989 Alaska Statewide Student Testing Program. Data were analyzed with multiple regression analysis with three domains of background variables controlled. Results indicated that, although the average achievement score was lower for students in small schools than in large schools, (a) the negative effect of disadvantaged background on student achievement was significantly less in small than in medium or large schools and (b) the interaction of disadvantaged status and school size explains additional variance in student achievement.

The depth and extent of poverty among children has grown appreciably in the last decade (Lino, 1992; Shapiro & Greenstein, 1991). Moreover, the proportion of minority children in American schools has increased substantially in recent decades and will increase dramatically in the future (Natriello, McDill, & Pallas, 1990). The predicament of impoverished, minority, and handicapped children in schools has become a "crisis of risk" in American schooling (e.g., Bull & Garrett, 1989; Oakes, Bell, & Camp, 1990; Taylor & Piché, 1990).

Small school size is one circumstance thought possibly to benefit disadvantaged students (e.g., Cross, 1990; Fowler & Walberg, 1991; Friedkin & Neccochea, 1988; Plecki, 1991). Small school size is thought to reduce the negative influences of risk factors (e.g., poverty), whereas large size may well compound the negative affects (cf. Friedkin & Neccochea, 1988; Howley, 1989). If research confirms such hypotheses, then taking steps to preserve small schools, imitating the features of small schools (e.g., school-within-a-school strategies), and creating smaller schools as opportunities arise would make good policy sense, at least for disadvantaged students.

Introduction

The relationship between group size and social differentiation is a classical theme in social psychology and the sociology of groups. A well-documented conclusion is that group size is negatively associated with social differentiation (e.g., Gerth & Mills, 1946; Wolff, 1950; Coser 1971). Large grouping entails formal and informal hierarchies that channel communication and regulate social interaction. Thus, "larger groups become societies of unequals: In order to maintain themselves, they must be structurally differentiated" (Coser, 1971, p.188). In contrast, small groups require less formal organization and allow intense, personal interaction among group members; the interaction pattern in small groups is less affected by individual members' social status. In a sense, small grouping may function to counter the differentiation in members' social relationships, which are otherwise stratified by the existing system in the large society.

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Prior research about school size has been based largely on theories of organization. For example, Friedkin and Neccochea (1988) hypothesized that aggregate achievement is contingent on variation in the "opportunities" and "constraints" that confront schools and districts of differing size. Aggregate student socioeconomic status was the focal contingency in this study. These researchers found that at lower levels of socioeconomic status (SES), school or district size was negatively associated with school performance; at higher SES levels, size was positively associated with performance.

Friedkin and Neccochea (1988), however, used the district—rather than the individual student—as the unit of analysis. They omitted other possibly relevant influences, such as school administration and intervention strategies. The authors, in fact, advised researchers to study effects at the level of the individual student and to include influences in addition to SES and size (Friedkin & Neccochea, 1988, p. 247).

Certainly, student characteristics other than SES—e.g., academic motivation, study habits, and preference for particular subjects—contribute to the variance of achievement scores. Taking the individual as the unit of analysis allows us to control for the complex effects of these variables. In this way, the interaction effect of school size and structural disadvantage on individual achievement can be more clearly identified.

Prior research from a variety of disciplines suggests that social differentiation among students and teachers is less extreme in small schools than in large schools. Specifically, in small schools, such structural factors as race and SES may regulate instructionally relevant interactions less stringently than in large schools. As a result, small schools may better facilitate the learning of disadvantaged students than large schools, *ceteris paribus* (Fowler & Walberg, 1991). One might suspect that small school size would alter, but not erase, the negative effect of risks. However, knowledge of *any* educational context that reduced pre-existing risks ought to be welcome news. Benjamin Bloom, after all, reminds us that schooling is a "weak treatment."

The present study is intended to supplement previous research on the small-size hypothesis by: (a) taking the individual student as the unit of analysis; (b) employing data from a single, largely rural state (Alaska); (c) incorporating multiple status indicators into one ordinal measure to reflect educational disadvantage; and (d) applying more rigorous statistical controls of the confounding influences on academic achievement.

Method

We used data collected by the Alaska Statewide Student Testing Program in fall 1989 (Stofflet, Fenton, & Silverman, 1990). The Iowa Test of Basic Skills (ITBS), Form G, was administered in 1989 to over 23,000 students in grades 4, 6, and 8—more than 95% of the state population was enrolled in these three grades.

Besides ITBS test scores in reading, writing, and mathematics, the program also collected information on (a) students' background as reported by teachers, (b) students' academic attitudes and study habits reported by students, and (c) school climate as reported by principals. Investigators also incorporated into the dataset information about school districts from state government reports, including student-teacher ratio per classroom, community size, and various measures of educational costs. (For original measures and questions, see Stofflet, Fenton, & Silverman, 1990.)

Selected Cases

Students who reported that they had attended the same school district for at least four years prior to the survey were selected for study. The cases selected on this basis include 5,589 4th graders, 3,930 6th graders, and 4,034 8th graders. Although Alaska Natives, migrant students, and students from small schools are overrepresented among these cases, the distributions of other variables do not differ markedly across the sampled and the nonsampled groups (see Appendix 1). Analysis of the data on students who had changed districts provides a supplementary opportunity to test the hypothesis that small schools mitigate disadvantage. Logically, among this latter group, the interaction effect should exist in an attenuated form, obscured by students' experiences attending different schools.

Focal Variables

We used the normalized composite test score of the ITBS to represent the dependent variable, academic achievement. School size was estimated by the average number of students per tested grade level. Unfortunately, extant survey data

did not provide exact enrollments. Rather, the dataset provides only a 3-category measure of school size: *small*, if its average number of students per tested grade was fewer than 20, and *large*, if the average number was greater than 60. Schools between these extremes were considered as *medium*. The categorical measure reasonably represents the concepts of small, medium, and large at the elementary level: an upper limit of about 180 students for a small K-8 school and a lower limit of about 540 for a large K-8 school (Eberts, Kehoe, & Stone, 1984).

We used four variables about individual students to operationalize the construct of disadvantage: (a) ethnic status (Alaska Natives and American Indians, Hispanics, and Blacks); (b) migrant education status; (c) Chapter 1 status; and (d) handicapped status. The resulting 5-scale measure was coded *0* through *4*, with *0* indicating no disadvantage experienced by the respondent and *4* reflecting all counts of disadvantage.

Control Variables

To focus on the interaction effect of school size and educational disadvantage on academic achievement, we attempted to control for the confounding effects of other factors on achievement. Control variables, which represent some of the factors commonly presumed to influence student academic outcomes in the school effects literature (e.g., Alexander, 1992; Oakes, 1985; Walberg, Bole, & Waxman, 1980), are conceptualized within the three domains described below.

The first domain, *school resources*—largely represented by information reported by the state government—include total cost per pupil, adjusted cost by areas, instructional cost, student-teacher ratio, and community size. Average class size as estimated by the principal can also be considered as a measure of school resources, since maintaining small class size requires greater resources. Including this variable also allows us to control for the presumably related effects of small class size versus small school size.

The second conceptual domain is *school climate*. This domain is derived from principals' responses to three sets of questions (see Appendix 2). One set of questions asked about the degree to which seven administrative strategies were used in a school (e.g., homework policy, financial rewards for good teachers; $\alpha = .91$). A second set of questions inquired about the extent to which 12 instructional strategies were used in teaching (e.g., peer coaching; $\alpha = .94$). We created a 12-count scale based on the number of those strategies that were reportedly used "a lot." Finally, a third set of questions asked about the extent to which 12 problems existed in a school (e.g., student absenteeism; $\alpha = .97$). We constructed a 12-count scale using the number of problems that were admitted to be "serious."

Student academic background variables constitute the third domain and comprises four measures: (a) attendance in a kindergarten or preschool program (a dummy variable); (b) the importance students ascribed to three academic subjects (counts of "very important" for reading, writing, and mathematics); (c) the extent to which students reported liking these three academic subjects (counts of "like a lot" for each subject); and (d) frequency of out-of-school reading (a dummy variable with daily reading versus monthly reading or less).

Analysis

We took two approaches in examining the hypothesized interaction effect. First, we regressed achievement on educational disadvantage and the control variables, within each of the three school-size categories. The resulting unstandardized regression coefficients from the three equations were then compared for each of the three grades. The hypothetical interaction effect between our measure of disadvantage and school size would be reflected in increasingly larger regression coefficients across the three size categories.

As a second approach for examining interaction effects, cross-product variables were constructed (Aiken & West, 1991). The 3-category variable of school size was recoded into two dummy variables. One is small (*1*) versus others (*0*) and the other is large (*1*) versus others (*0*); medium schools serve as the comparison group. Thus, the regression coefficients for the two dummy variables can be interpreted as the effects on achievement of small and large school size, as contrasted to the medium-size school. Two cross-product vectors were generated by multiplying the disadvantage variable by these two dummy variables. The statistical significance of the interaction effect is indicated by the *F* ratio associated with the change in variance (R^2) associated with the entry of the two cross-product vectors into the equations.

Table 1
Descriptive statistics for focal variables

Variables	Grade 4	Grade 6	Grade 8
Normalized composite achievement score			
M	51.10	52.87	54.93
SD	22.78	23.42	21.50
N	5,589	3,930	3,897
Educational disadvantage			
M	.48	.48	.42
SD	.79	.79	.75
N	5,589	3,930	4,034
School size (frequencies)			
small	971	881	648
medium	1,580	1,000	386
large	3,038	2,119	3,000

Results

Table 1 presents descriptive statistics for the focal variables: composite achievement, educational disadvantage, and school size. The three grades are generally similar.

Zero-order correlations. Table 2 presents the zero-order correlations between academic achievement and all other variables, within grade level. A unique feature of Alaska emerges. The correlations between achievement and each of the three measures of costs (total cost, adjusted cost, and instructional cost) are consistently *negative*. This result may be explained by the remote and rural environment of Alaska, where small rural schools serve a large portion of Native Alaskan or American Indian students. Higher educational costs may result from risky circumstances (e.g., poverty, remote location) that make it difficult for students to achieve at high levels. One can argue, therefore, that the correlation is spurious; both high costs and low achievement are related to environmental challenges.

As expected, the correlations between (a) achievement and (b) community size and class size are positive, as the measures reflect the scale of settlement and operation and, hence, the volume of resources potentially available to nurture achievement. The student-teacher ratio per classroom is also positively associated with achievement. This finding, again, probably represents an artifact of rural and remote schools, where, in Alaska as elsewhere in rural America, low student-teacher ratios coincide with high rates of disadvantage.

School climate variables also correlate modestly with academic achievement in the expected direction. The more "effective" administrative and instructional strategies reported as being used, the higher the level of achievement; the more serious problems admitted, the lower the level of achievement. Also as expected, student academic background is positively associated with achievement. Among all zero-order correlations, however, educational disadvantage exhibits the strongest relationship with all variables: It is negatively related to achievement within each grade level.

Multiple Regression Analyses

Using multiple regression analysis, we tested three within-grade equations for each of the three categories of school size. We controlled for the variables of school resources, school climate, and student academic background.

The regression coefficients associated with the disadvantage variable are presented in Table 3. A stable pattern appears across grade levels: The increase in magnitude of the raw coefficients of disadvantage is related to school size. While the effect of disadvantage on achievement is negative

Table 2
Zero-order correlations between academic achievement and school resources, school climate, student academic background, school size, and disadvantage

Variables	Grade 4	Grade 6	Grade 8
School resources			
Total cost per pupil	-.33	-.40	-.40
Adjusted cost	-.29	-.38	-.39
Instruction cost	-.32	-.39	-.39
Community size	.31	.39	.40
Student teacher ratio	.28	.38	.37
Class size	.21	.25	.34
School climate			
Administrative strategies	.05	.09	.11
Instructional strategies	.07	.16	.09
Serious problems	-.22	-.27	-.16
Student academic background			
Liking subjects	.09	.16	.25
Perceived importance	.23	.24	.22
Home study every day	.14	.31	.17
Preschool attendance	.09	.09	.12
Focal variables			
School size	.32	.37	.40
Disadvantage	-.45	-.49	-.38
minimum pairwise *N*	4876	3860	3500

Note. All coefficients are significant ($\alpha = .001$, 2-tailed).

in every category of size, small size is associated with the *smallest* effect of disadvantage and large size is associated with the *largest* effect of disadvantage. This finding matches the hypothesized pattern of the interaction and is consistent with findings of previous research.

In order to determine if the interaction between educational disadvantage and school size was statistically significant, we examined the increment in R^2 associated with the cross-product vectors. Table 4 shows that it was, and across all grade levels. In addition, as indicated by the raw regression coefficients of the interaction vectors, all coefficients are significant (except the interaction between large size and disadvantage for the 8th grade panel).

The pattern of the interaction effects revealed here, of course, is consistent with the findings from the earlier equations that were estimated separately within each of the three school size categories. In all three grade levels, the interaction vector of small size and disadvantage has positive regression coefficients, whereas the interaction vector of large size and disadvantage has negative coefficients. The overall pattern of both sets of analyses confirms the interaction of school size and our measure of disadvantage.

Table 3
Regression of academic achievement on educational disadvantage in small, medium, and large schools, controlling for school resources, school climate, and student academic background

	School Size		
	Small	Medium	Large
Grade 4			
b	-4.788	-11.798	-14.762
s.e.	.731	.798	.794
Intercept	62.352	115.134	160.829
Adjusted R^2	.299	.196	.191
N	786	1321	2769
Grade 6			
b	-5.683	-9.877	-14.881
s.e.	.668	1.032	.891
Intercept	21.698	-1.494	26.593
Adjusted R^2	.359	.224	.244
N	810	1000	2118
Grade 8			
b	-4.904	-8.506	-9.591
s.e.	.833	1.729	.695
Intercept	38.263	83.745	90.515
Adjusted R^2	.299	.334	.176
N	507	272	2721

Note. All coefficients are significant ($\alpha = .001$).

We assumed that the interaction of school size and risk factors would be ordinal, rather than disordinal (cf. Aiken & West, 1991). That is, when regressing achievement on disadvantage separately for students in small schools and students in large schools, while the slopes of the two regression lines for small schools and large schools would differ, the two lines would not be expected to intersect within the range of measured disadvantage (see Figure 1, first plot). In other words, although the average achievement of students in large schools would be higher than that of students in small schools, this discrepancy would be smaller among the more disadvantaged students and larger among the more advantaged students.

To examine the form of the interaction in the present data, the intersection point of the two linear regression lines for small schools and large schools must be located. Assuming other factors to be equal through statistical control, we may use the unstandardized regression coefficients of disadvantage and the intercept values to calculate the point on disadvantage where the two lines intersect (Aiken & West, 1991). If the point of intersection falls outside the range of disadvantage, the interaction is considered to be ordinal, otherwise it is disordinal (see Figure 1, second plot).

Since, at the point of intersection, the predicted Y's are equal for the two groups, to find the intersection point we simply solve the equation, $a_s + b_sX = a_l + b_lX$, where a_s and b_s denote the intercept and unstandardized regression coefficient, respectively, for the small-school group, and a_l and b_l are the intercept and unstandardized regression coefficient for the large-school group. X is the independent variable, disadvantage. (Controlled variables are identical on the two sides of the equation and thus cancel each other.)

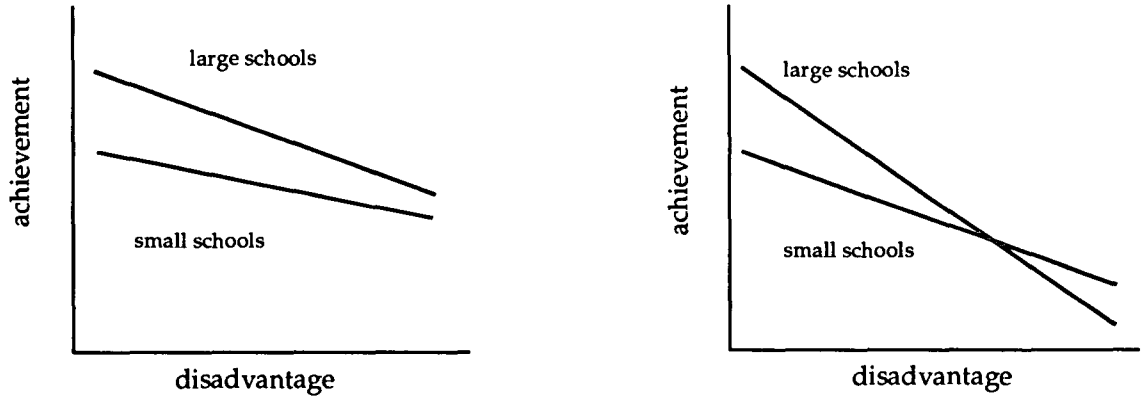

Figure 1. *Hypothetical ordinal (left) and disordinal (right) interaction between school size and disadvantaged status*

The resulting intersection points are approximately 1 for the three grades. Thus, the interaction of educational disadvantage and school size does not appear to be ordinal. The disordinal effect suggests that among students who were identified with one or more disadvantages, those who were in small schools had *higher* average achievement than equally disadvantaged students in large schools (holding other variables constant).

Note, however, that the *average* achievement score seems different across categories of school size. Average achievement in large schools is higher than in medium-size schools, and average achievement in small schools is lower than in medium-size schools. This pattern is revealed in the values of the intercept, which is the mean achievement for medium-size schools, modified by the school size effects (see Table 4). In the fourth grade, small schools have an achievement mean of 76.000 (by subtracting 6.754 from the intercept 82.574, the mean of medium-size schools); large schools have a mean of 84.907 (by adding 2.333 to the intercept 82.574). Such a pattern, however, is not significant among 8th graders.

Excluded Students

Analyses of students who *had* changed school districts prior to the assessment can offer supplementary information in testing for the interaction of school size and disadvantage. As before, analyses were performed at each grade level and in each school size category, followed by significance testing of the increment in R^2 associated with the interaction term. Table 5 presents the results of these analyses.

As expected, the general pattern of interaction remains. Among the students who had changed school districts, the increase of the negative effect of disadvantage on achievement is still, though more weakly, related to the school size. The R^2 increments are smaller and, further, the linear pattern observed in Tables 3 and 4 is obscured. These data offer additional, albeit weaker, evidence that supports the hypothesized interaction effect. In particular, the analysis points to the need to take student mobility into account when investigating the effects of school size on achievement.

The results reported above indicate that given similar school resources, school climate, and academic background, disadvantaged students are generally served better in small schools than in medium-size schools. In contrast, they are served less well in large schools than in medium-size schools.

Discussion

Our results suggest that, with medium-size schools as a referent point (approximately 180-540 students in grades K-8), disadvantaged students perform better in small schools and worse in large schools. That is, small schools in Alaska appear to mitigate the effects of disadvantage, whereas large schools tend to compound those effects. The disordinal interaction also suggests that, among disadvantaged students, those attending small schools achieved better than equally disadvantaged students attending large schools. This result is particularly meaningful since, in Alaska, school size is positively related to achievement in zero-

Table 4
Regression of academic achievement on school size, educational disadvantage, and cross-product vectors (school size and educational disadvantage)

Focal vectors	Grade 4	Grade 6	Grade 8
Intercept	82.574***	37.497***	55.496***
Small size	-6.574***	-2.868	-3.727
Large size	2.333**	3.146***	-1.658
Educational disadvantage	-10.645***	-8.899***	-8.741***
Small size X disadvantage	4.279***	2.738*	3.404*
Large size X disadvantage	-4.065***	-5.962***	-.372
R^2 increment[a]	.010***	.010***	.003**

[a]Due to cross-product vectors.
* $p < .05$. ** $p < .01$. *** $p < .001$.

order correlations. Thus, the general benefits of large schools do not accrue to disadvantaged students in those schools.

We believe that our methodology renders the findings comparatively robust. The study focuses on a population of students in one state who are in continuous attendance in a particular school district. The analysis controls for variables often identified as critical for effective schooling. On the other hand, the data did not provide us with a continuous measure of school size and, further, the focus of the study on disadvantage means that we can make no claims about the relationship of size and achievement for students who are not disadvantaged. While the R^2 increments of the interaction vectors are admittedly small, the related effects on student achievement are meaningful and, for small schools, positive.

Future studies might adopt similar approaches, perhaps employing hierarchical linear modeling to separate classroom, school, and district effects from student effects. The evidence of the present study, however, suggests the need to account for student mobility in separating such effects. Finally, we believe that state policy and demographic contexts will exert an influence on the relationships observed in this study; therefore, we also recommend the use of state datasets in future work.

Policy Implications

This study attempted to build on the findings of Friedkin and Neccochea (1988), the first researchers to confirm an interaction of school size with socioeconomic status. Our findings are similar, although not a replication due to differences in data source and conceptualization.

Both studies, however, point to a difficult policy issue: Small schools appear to be more responsive to disadvantaged students than are large schools. Friedkin and Neccochea's (1988) findings imply that large schools are more responsive to advantaged students. Our study did not address this issue, but it did find that large schools in Alaska compound the negative effects of disadvantages within a context where school size is positively associated with achievement outcomes. This circumstance is not inconsistent with the findings of Friedkin and Neccochea.

The general tendency of the last century of American schooling has been to construct larger and larger schools on the premise that such a course allows the state to realize economies of scale. In fact, few studies have examined whether consolidation has produced such economies, or even if such economies actually result in monetary savings. In most cases, the distinction between achieving economies of scale and saving

Table 5
Analyses based on students who had changed schools: Regression of academic achievement on educational disadvantage in small, medium, and large schools, controlling for school resources, school climate, and student academic background.

School size	Grade 4	Grade 6	Grade 8
Small	10.078	-10.069	-4.332
Medium	-10.758	-12.225	-13.826
Large	-14.055	-13.118	-11.434
Adjusted R^2 increment[a]	.002	.000 (n.s.)	.001

Note. All coefficients and adjusted R^2 increments are significant ($\alpha = .05$) except where indicated.
[a]Due to cross-product vectors.

money is lost (DeYoung & Howley, 1992). If economies of scale permitted savings to be redirected to other purposes (e.g., providing a rich curriculum, serving disadvantaged students more responsively), net savings would not necessarily accrue. In any case, recent studies suggests such savings, at best, are difficult to realize (e.g., Schwinden & Brannon, 1993; Streifel, Foldsey, & Holman, 1991), even when they are the announced purpose of consolidation (DeYoung & Howley, 1992).

The question then becomes who benefits from the creation of larger schools, which provide, but do not guarantee, a richer curriculum (Haller, Monk, Spotted Bear, Griffith, & Moss, 1990). Existing evidence might suggest to some observers that the affluent have generally benefitted at the expense of the disadvantaged.

Our intuition is that such a situation varies considerably from state to state. The history, economics, culture, and politics of a state serve as a context that can have profound results for policy and school operations. In fact, if the state trial results of the National Assessment of Educational Progress are any indication (Mullis, Dossey, Owen, & Phillips, 1991), some states seem to be serving disadvantaged students much better than others. This circumstance is likely to have roots in the particular policy context, rather than in some unfathomable character of the human condition. The rich do not always need to get richer and the poor, poorer.

Educators and policymakers, however, ought to be wary of any calls to replicate the strategies that, say, Montana uses to achieve exemplary results for its disadvantaged students. Such an argument presents a chain of unexamined assumptions that first need to be considered critically. Specifically, to what extent is the phenomenon (a) circumstantial and specific to the context or (b) strategic and intentional? What interaction of history, economics, culture, and politics shapes that state's educational system? Is any of this capable of imitation elsewhere? If so, under what circumstances? Too often, no such questions are asked, and too seldom, when asked, are they ever adequately considered.

Policymakers in Alaska, however, should be comforted by the fact that the evidence to support the view so common elsewhere (that consolidation saves money) is surprisingly weak (e.g., Valencia, 1984; Stemnock, 1974; Streifel et al., 1991). The very remote character of small-scale schooling in Alaska, in any case, indicates that other alternatives must be sought there. It seems clear from the present study, however, that small schools make a meaningful contribution to improving the prospects for many disadvantaged students in Alaska.

The question, particularly in the face of the declining revenues that seems Alaska's recent economic lot, is one of political values: "Is making such a contribution a priority?" In the past, this question has often provided an opportunity for rhetoric and action to part company.

References

Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions.* Newbury Park, CA: Sage Publications.

Alexander, K. (1992). Financing the public schools of the United States: A perspective on effort, need, and equity. *Journal of Educational Finance, 17*(2), 122-144.

Bull, K., & Garrett, M. (1989, March). *Dimensions of being "at-risk": Children and youth in rural environments.* Paper presented at the annual meeting of the American Council on Rural Special Education, Ft. Lauderdale. (ERIC Document Reproduction Service No. ED 315 212)

Coser, L. (1971). *Masters of sociological thought: Ideas in historical and social context* (2nd ed.). San Diego, CA: Harcourt Brace Jovanovich.

Cross, C. (1990, August). *Who is the American eighth grader?* (Remarks to the National Conference of State Legislators, Nashville, TN). Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.

DeYoung, A., & Howley, C. (1992). The political economy of rural school consolidation. *Peabody Journal of Education, 67*(4), 63-89.

Eberts, R., Kehoe, E., & Stone, J. (1984). *The effect of school size on student outcomes* (Final Report). Eugene, OR: Center for Educational Policy and Management, University of Oregon. (ERIC Document Reproduction Service No. ED 245382)

Fowler, W., & Walberg, H. (1991). School size, characteristics, and outcomes. *Educational Evaluation and Policy Analysis, 13*(2), 189-202.

Friedkin, N., & Neccochea, J. (1988). School system size and performance: A contingency perspective. *Educational Evaluation and Policy Analysis, 10*(3), 237-249.

Gerth, H., & Mills, C. W. (Eds.). (1946). *From Max Weber: Essays in sociology.* New York, NY: Oxford University Press.

Haller, E., Monk, D., Spotted Bear, A., Griffith, J., & Moss, P. (1990). School size and program comprehensiveness: Evidence from High School and Beyond. *Educational Evaluation and Policy Analysis, 12*(2), 109-120.

Howley, C. (1989). Synthesis of the effects of school and district size: What research says about achievement in small schools and school districts. *Journal of Rural and Small Schools, 4*(1), 2-12.

Lino, M. (1992, December). *Economic status of families with children: Rural and urban.* Paper presented at the Outlook '93 Conference, Washington, DC.

Mullis, I., Dossey, J., Owen, E., & Phillips, G. (1991). *The state of mathematics achievement: NAEP's 1990 assessment of the nation and the trial assessment of the states.* Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, National Center for Education Statistics.

Natriello, G., McDill, E., & Pallas, A. (1990). *Schooling disadvantaged children: Racing against catastrophe.* NY: Teachers College Press.

Oakes, J. (1985). *Classroom climate. Keeping track: How schools structure the quality.* New Haven, CT: Yale University Press.

Oakes, J., Bell, R., & Camp, T. (1990). *Multiplying inequalities.* Santa Monica, CA: Rand Corporation.

Plecki, M. (1991, April). *The relationship between elementary school size and student achievement.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Schwinden, T., & Brannon, L. (1993). *School reorganization in Montana: A time for decision.* Helena, MT: Montana School Boards Association.

Shapiro, I., & Greenstein, R. (1991). *Selective prosperity: Increasing disparities since 1977.* Washington, DC: Center on Budget and Policy Priorities.

Stemnock, S. (1974). *Summary of research on size of schools and school districts.* Arlington, VA: Educational Research Service, Inc. (ERIC Document Reproduction Service No. ED 140 459)

Stofflet, F., Fenton, R., & Silverman, B. (1990). *The Alaska statewide assessment: Implementation and outcome 1989.* Juneau, AK: Alaska State Department of Education. (ERIC Document Reproduction Service No. ED 323 050)

Streifel, J., Foldsey, G., & Holman, D. (1991). The financial effects of consolidation. *Journal of Research in Rural Education, 7*(2), 13-20.

Taylor, W., & Piché, D. (1990). *A report on shortchanging children: The impact of fiscal inequity on the education of students at risk* (Report for the Committee on Education and Labor, U.S. House of Representatives, One Hundred First Congress, Second Session; Serial 101-U). Washington, DC: U.S. Government Printing Office. (ERIC Document Reproduction Service No. ED 328 654)

Valencia, R. (1984). *School closures and policy issues* (Policy Paper No. 84-C3). Stanford, CA: Institute for Research on Educational Finance and Governance. (ERIC Document Reproduction Service No. ED 323 040)

Walberg, H. J., Bole, R. E., & Waxman, H. C. (1980). School-based family socialization and reading achievement in the inner city. *Psychology in the Schools, 17*(4), 509-514.

Wolff, K. H. (Ed. and Trans.). (1950). *The sociology of Georg Simmel.* New York: Free Press.

Appendix 1

Percentages of students with disadvantaged status and school size among those having continuously attended the same school district (numbers without parentheses) and among the students who had changed schools (numbers within parentheses)

Variable	Grade 4		Grade 6		Grade 8	
Ethnic status						
Alaska Native	21.5	(11.8)	23.1	(12.2)	20.0	(13.1)
American Indian	.9	(1.7)	1.4	(1.6)	1.3	(2.1)
Asian/Pacific	3.5	(4.6)	3.5	(5.1)	3.6	(4.9)
Black	4.3	(6.9)	2.9	(6.1)	3.6	(6.3)
Hispanic	1.4	(2.9)	1.7	(2.9)	1.8	(2.6)
White	68.2	(72.8)	67.4	(72.1)	69.8	(71.1)
N	5114	(2348)	3612	(3240)	3540	(2239)
Chapter 1						
Yes	10.0	(7.8)	8.5	(7.2)	5.9	(3.9)
No	90.0	(92.2)	91.5	(92.8)	94.1	(96.1)
N	4963	(2279)	3543	(3189)	3329	(2152)
Handicapped						
Yes	8.2	(8.6)	7.1	(8.1)	7.5	(9.1)
No	91.8	(91.4)	92.9	(91.9)	92.5	(90.9)
N	4929	(2270)	3510	(3170)	3355	(2162)
Migrant						
Yes	7.1	(2.8)	7.9	(3.8)	8.9	(4.2)
No	92.9	(97.2)	92.1	(96.2)	91.1	(95.8)
N	4958	(2276)	3527	(3185)	3369	(2160)
School size						
Small	17.4	(9.5)	20.6	(9.7)	16.1	(10.1)
Medium	28.3	(35.4)	25.4	(33.8)	9.6	(9.2)
Large	54.4	(55.0)	53.9	(56.5)	74.4	(80.7)
N	5589	(2556)	3930	(3448)	4034	(2503)

Appendix 2
School climate: Items and reliability

School problems (α = .97)

1. student absenteeism
2. lack of parent interest
3. discipline
4. lack of teacher commitment
5. teacher absenteeism
6. teacher turnover
7. low standards for students
8. bad material/equipment
9. class size
10. vandalism/robbery/theft
11. physical assault among students
12. student use of drugs/alcohol

Instruction (α = .94)

1. peer coaching
2. display student work
3. use math manipulatives-elementary
4. use math manipulatives-interim
5. student cooperative learning group
6. computer enhanced instruction
7. writing as a process
8. content area reading
9. inquiry/discussion in science
10. literature based reading
11. problem solving approach overall
12. calculator used

Leadership (α = .91)

1. instruction in study skills
2. policy on amount of homework
3. recognition for good students
4. financial rewards for good teachers
5. nonfinancial rewards for good teachers
6. program to reduce absenteeism and tardy
7. reduce administrative burden on teacher

Note. Only 6th grade data are presented; 4th and 8th grade data are similar.