The Matter of Size:
A Review of the Research on Relationships between School and District Size, Pupil Achievement and Cost

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This article reviews the research on relationships between school and district size, pupil achievement and cost. The evidence is evaluated in terms of the educational reform movement and the growing sophistication of telecommunications. Policy implications for school district consolidation and the role of intermediate districts are discussed.

Optimal school size and school district consolidation has been a concern of educators and other state and national officials for over a century. Conclusions from studies on relationships between school and district size, pupil achievement and cost have taken a dramatic turn in recent years. From the beginning of this century through the 1960s, the overwhelming evidence seemed to support large schools and school districts in terms of economies, program quality and caliber of staff. As research designs began to take into account total cost and socioeconomic status of pupils, and to include additional criteria such as achievement, pupil self-image, and success in college, economies of scale evaporated at relatively low numbers of pupils and the disadvantages of large size become readily apparent. The current interest in "effective schools" has highlighted the importance of school climate and school culture in affecting pupil achievement, especially for at risk populations. The supportive social environment of small rural schools had long been recognized [2], but not appreciated for its pedagogical merit.

The size research has two foci: the district and the school. For very small districts, these are one and the same thing. Large districts have a choice, however; they may operate schools over a wide range of sizes. Thus, a large district may operate small schools as a matter of district policy, though most do not. Large schools also have an option of organizing into "houses," or, "schools within schools," in an attempt to secure the advantages inherent in both large and small size schools without the corresponding disadvantages. The review will consider research related to both school size and school district size.

SCHOOL AND DISTRICT SIZE AND ACHIEVEMENT

The New York State mandated Pupil Evaluation Program (PEP) provides longitudinal comparisons in achievement from 1966 to the present among school districts of different sizes and types. Specified achievement tests are administered to pupils in grades 3, 6, and 9. Pupils scoring within the first three stanines are classified as being "Below Minimum Competence." By definition, 23% of the state's student population fall into this category. The pattern first observed in 1966 has not changed markedly. Results in 6th grade reading are typical. Of all city pupils, 29% fell in the "Below Minimum Competence" category in 1966. In New York City, 40% did; and in Buffalo, 39% did. For suburbs, only 15% of the pupils were so classified; and for rural areas, 18% [17]. The better achievement of suburban children could reasonably be attributed to the fact that they come disproportionately from upper and upper-middle income families. Such children tend to achieve at higher levels than children coming from lower income family environments. This would not account for the relatively high achievement of rural children, however, since their socioeconomic status is similar to that of large city children.

Twenty years later the situation is quite similar. Table 1 reports the PEP norms for the 1985-86 school year for reading and mathematics in grades three and six and for writing in grade five. The "Small Central Districts" category is composed largely of rural districts including all districts with enrollments under 1,100 pupils. This category tends to be slightly below the average results for medium and large central districts but well above all categories of cities and for the state as a whole. Most suburban districts are in the medium and large central districts categories. The interesting things about the performance of small school districts is not that their average is below that of the larger central school districts, but that, given the differences in socioeconomic status, they do so well.

The achievement of students in small school districts remains high as measured by the New York State Regents Preliminary Competency Tests given in eighth grade. Results by type of school for 1985-86 are reported in

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Table 2. Districts are required to provide remedial instruction to students failing to pass these examinations. The small district average is actually higher than that for medium central districts, but slightly below that of the large central districts. Small district performance also exceeds that of all city categories and state average performance.

Multiple regression analysis by Swanson et al. [29] of data drawn from the New York State Education Department's Basic Educational Data System (BEDS) showed district size (measured by average daily attendance) not to be a factor strongly related to school achievement defined as median sixth grade reading score, percent below minimum competency in sixth grade reading,

TABLE 1
Statewide Results, Percent Above State Reference Point For The Grade 3 Reading and Mathematics, Grade 5 Writing and The Grade 6 Reading and Mathematics Tests: Spring 1986

Type of School	Grade 3		Grade 5	Grade 6	
	Reading	Math	Writing	Reading	Math
Public					
New York City	60.4%	68.4%	77.7%	63.3%	63.5%
Large Cities	78.4%	88.2%	80.6%	72.7%	81.0%
Medium Cities	82.6%	92.4%	87.6%	79.2%	87.0%
Small Cities	88.4%	94.5%	88.8%	82.4%	89.3%
Large Central and Village Districts	92.4%	96.8%	91.4%	88.8%	93.0%
Medium Central Districts	91.4%	96.6%	89.7%	87.4%	91.8%
Small Central Districts	89.9%	95.4%	88.9%	87.7%	92.4%
Total Public	79.4%	85.7%	85.7%	78.8%	82.2%
Nonpublic					
New York City Schools	81.6%	85.2%	85.8%	79.0%	84.4%
Other Schools	91.3%	93.9%	90.6%	88.2%	92.1%
Total Nonpublic	86.1%	89.2%	88.0%	83.1%	87.9%
Total State	80.7%	86.4%	86.1%	79.6%	83.3%

Source: New York State Education Department, Division of Educational Testing. *State tests and high school graduation summaries, 1985-86 school year.* Albany, N.Y.: The State Education Department, October 1986.

TABLE 2
Statewide Results, Percent of Enrollment Above State Reference Point for the Preliminary Competency Tests, Given in Eighth Grade: 1985-86

Type of School	Reading	Writing
Public		
New York City	85.8%	83.6%
Large Cities	83.3%	83.5%
Medium Cities	86.4%	83.5%
Small Cities	90.4%	87.4%
Large Central and Village Districts	94.7%	92.4%
Medium Central Districts	92.5%	89.0%
Small Central Districts	94.6%	89.5%
Total Public	90.5%	88.0%
Nonpublic		
New York City Schools	94.0%	96.3%
Other Schools	96.3%	97.7%
Total Nonpublic	94.9%	96.9%
Total State	91.1%	89.3%

Source: New York State Education Department, Division of Educational Testing. *State tests and high school graduation summaries, 1985-86 school year.* Albany, N.Y.: The State Education Department, October 1986.

and high school dropout rate. School size was a significant predictor only for percent reading below minimum competency. Here, small district size was associated with low percentages of poor readers. Area of school district was a significant predictor for both reading criteria. Large area, an indicator of rurality, was associated with high median reading scores and low percentages reading below minimum competency. Neither size nor area was a predictor of dropout rates. The factors most strongly related to dropout rates were socioeconomic indicators.

An analysis by Monk [15] of a random sample of New York State school districts pointed to differences in curricular offerings and teacher qualifications between large and small districts. Opportunities to study science, especially by non-college bound students, are fewer in small districts; but the science teachers appear to be as well trained as in large districts. Opportunities to study mathematics and English are not related to district size, but opportunities to study a foreign language are greater in small districts. Despite their availability, students in small districts are less likely to enroll in science, math and foreign languages. Opportunities to study advanced courses are virtually non-existent in small districts. Barker [1] found a similar pattern in a national random sample of large (enrollments in excess of 1000) and small schools (enrollment under 500).

Monk [15] also found that class sizes tend to be smaller in small districts, but they are not uniformly smaller across subject areas. Mathematics, English and foreign language teachers tend to have less training and experience in small districts compared to large districts. There is a greater incidence of first year teachers in small districts and teachers are more likely to teach outside their area of certification.

Davis [7] surveyed the superintendents of the 107 smallest school districts (under 1250 enrollment) in New York State as to their opinions about the strengths and weaknesses of small schools. Overall, the superintendents felt good about their schools. At the elementary level, they were most highly satisfied with the teaching of reading followed by mathematics, music and physical education. Problem areas included foreign languages, science, literature, language skills and computer literacy.

At the secondary level, Davis found the superintendents to be most satisfied with the teaching of science and mathematics. The greatest dissatisfaction was with language arts, social studies, home economics and physical education. The greatest curricular weaknesses at the secondary level were limited electives and the meeting of individual needs.

In a study for the U.S. Office of Education, Kiesling [12] found that size of high school is negatively related to pupil achievement when enrollments exceed 1600 pupils. Twelfth grade achievement improved with school size up to about 1,200-1,600 students; but beyond that, when the background of the child, the child's intelligence and school expenditure were controlled, the relationship between size and achievement shifted from positive to negative.

A study by Turner and Thrasher [31] found no significant difference in the Iowa test scores between small or large districts. They also found no difference in grade point average between graduates of small versus large schools in the freshman year of college. Of ten other studies of high school size reviewed by Sher and Thompkins [26], six indicated that size of high schools did not correlate significantly with college success. Only two studies found a positive correlation between size and success.

Kreitlow [13], in a 10 year longitudinal study in Wisconsin, documented how pupil achievement scores improved for a period after consolidation of several school districts. This high level of achievement did not seem to continue after the initial change, however.

Bidwell and Kasarda [4], in their study of school achievement and organizational structure, suggest that district size has virtually no net effect on the reading and math achievement levels of students. A more critical factor is the variation in, or availability of, resources within the district. For example, quality of staff appears to more directly effect pupil output; but staff quality, in turn, is dependent upon money available and socio-economic characteristics of a district's population, not size of district.

Sher [25] observed, however, that the more highly educated a teacher, the more likely he/she would be to obtain a position in a consolidated or larger school system. Thus, better teaching is likely to occur in larger districts (if there is a link between length of teacher preparation and teaching effectiveness). At the other extreme, it was noted that very large districts also experience a drop in potential efficiency because of a rigidity which is not compatible with creating a wholesome learning environment.

Scott [24] found that staff turnover is proportionally higher in small districts than in larger ones. This makes it difficult for the small school to maintain a high level of efficiency as the faculty is more concerned with becoming familiar with each other, the students and instructional materials, than with developing an intensity and depth in teaching. Barker and Gump [3] found teachers to be more satisfied in small schools, as did Goodlad [9].

Barker and Gump [3] further concluded that large school size has an undesirable influence on the development of certain personal attributes of students. Specifically, they found that, in most large schools, leadership is dominated by just a few students, whereas in the small school, proportionally more students take an active part. The actual proportion of students who participate in extracurricular activities, and the satisfaction of students with their schooling, clearly supports the small local school districts over large consolidated schools. A 1986 study by the U.S. Department of Education [30] updated the Barker and Gump findings. This study reported that the participation rates in extracurricular activities were consistently greater for small high schools (200 or fewer seniors) than for larger schools. It also reported positive relationships between course credits,

hours of homework, test scores and grade average and involvement in extracurricular activities [30].

Although more varieties of subjects are available to students of the large school district, Baker and Gump observed that a given pupil participates in proportionally fewer of these electives than do students in small schools. They concluded, ". . . if versatility of experience is preferred over opportunity for specialization, a smaller school is better than a larger one; if specialization is sought, the larger school is the better" (p. 201).

SCHOOL DISTRICT SIZE AND COST

The analysis of New York State data by Swanson et al. [29] revealed that total revenues per pupil, total expenditures per pupil and operating expenditures per pupil declined as district size increased to about 3,000 pupils. Between 3,000 and 4,000 pupils there were no changes in the expenditures examined; above 4,000 pupils, per pupil expenditures began to increase with size. Further analysis showed that these curvilinear relationships could be explained equally well by district full valuation per pupil and district socioeconomic characteristics.

Sher [25] also found that what appears to be a relationship between cost and small size may, in fact, be a relationship between cost and assessed valuation. He reported that, in six studies of district economies of scale, where economies do exist, they are generally in very small districts and very small districts tend to have high property valuations per pupil.

A study in Oklahoma by White and Tweeten [32] estimated the optimal district size for a rural area to be 800 students when one measures just the financial cost in relationship to the quality of program. The preferable size drops to 675 when transportation costs are included. The study indicated that there is no difference in the operating costs of districts in the range of 400 to 1,000 students, but diseconomies arise as more students are required to be bussed to the schools.

An investigation in 1972 of 142 districts in Oregon revealed that as district size increased to nearly 51,000 pupils, the cost per pupil on the average decreased. However, in the range of students between 40,000 and 60,000 pupils, the differences in cost were small [23].

In a nine state study of 577 districts, James et al. [10] computed the optimum size for each state. Optimum was defined according to low per-pupil expenditures. The researchers concluded that even when considering only such a limited criterion, the "optimum" size of a district varies too greatly among states to make a generalization.

OPTIMUM SCHOOL SIZE

What size should a school be? Barker and Gump [3] were not specific, but they provided a useful guide as they concluded their classical work with these words:

> The data of this research and our own educational values tell us that a school should be sufficiently small that all of its students are

needed for its enterprises. A school should be small enough that students are not redundant. (p. 202).

Conant's study of the American high school [6] was more specific. He recommended a school with a minimum of 100 graduates per year.

Newman [19] reported that the optimum size of secondary schools falls in the range of 500 to 1,200 pupils. Student participation in school activities and general interaction among themselves is greatest in that range. Vandalism and delinquency is the lowest.

> (T)he opportunity that small schools provide for sustained contact among all members is a significant safeguard against alienation. The larger the school, the more difficult it is to achieve clear, consensual goals, to promote student participation in school management, and to create positive personal relations among students and staff. (p. 552).

Goodlad [9], in his comprehensive national study of *A Place Called School,* observes:

> Most of the schools clustering in the top group of our sample on major characteristics were small, compared with the schools clustering near the bottom. It is not impossible to have a good large school; it is simply more difficult.
>
> What are the defensible reasons for operating an elementary school of more than a dozen teachers and 300 boys and girls? I can think of none. (p. 309).

With respect to secondary schools, Goodlad writes:

> Clearly we need sustained, creative efforts designed to show the curricular deficits incurred in very small high schools, the curricular possibilities of larger schools, and the point where increased size suggests no curricular gain. . . The burden of proof, it appears to me, is on large size. Indeed, I would not want to face the challenge of justifying a senior, let alone a junior, high of more than 500 to 600 students (unless I were willing to place arguments for a strong football team ahead of arguments for a good school, which I am not). (p. 310).

In Boyer's [5] report of the Carnegie Foundation's study, *High School,* it is noted that research over the past several decades suggests that small schools provide greater opportunity for student participation and greater emotional support than larger ones. Acknowledging the difficulty of knowing the exact point when a high school becomes too large, he proposes that schools enrolling 1,500 to 2,000 students are good candidates for reorganizing into smaller units (using a school within a school concept). Turning to the issue of the small high school Boyer raises the question:

Can a small school provide the education opportunities to match the social and emotional advantages that may accompany smallness? We believe the preferred arrangement is to have bigness and smallness—a broad education program with supportive social arrangements. (p. 235).

A thorough study of the curricular offerings of 100 randomly selected secondary schools in New York State suggests that the curricular deficits of the small schools may not be as great as commonly believed. Monk and Haller [16] discovered no significant improvement in class size or in the number of course offerings as school size increased beyond 400 pupils in grades 9-12. They did conclude, however, "that the curricular offerings of the very smallest secondary schools . . . are seriously deficient" (p. 61). Along with Barker and Gump, they found that larger schools did offer more courses, but, "never did more than 12 percent of the students enroll in courses that are denied to their peers in the smallest high schools" (p. 59). It appears that the greater variety of courses offered by large schools tend to be at the introductory level, not at the specialization level. They speculate that this is a means of avoiding small class enrollments. Based on their analysis, Monk and Haller question the wisdom of reorganizing school districts for the sake of offering a richer curriculum.

OPTIMUM DISTRICT SIZE

Evidence gathered in the Great Plains Study (1968) encouraged its researchers to recommend that school districts in sparsely populated areas have a minimum of 1,500 students. The study also stated that a district should enroll over 20,000 students in order to provide comprehensive programs and necessary support services with efficiency of organization and optimum economy. If a large district were not possible, the study recommended that an intermediate district should be created to meet the special needs of the students. The Great Plains Study further suggested that districts with more than 50,000 pupils give thought to decentralization.

The White House Conference on Education [34] concluded that the minimum size for a district should be 40 teachers and 1,200 pupils. The Conference further recommended a maximum district size of 10,000 pupils.

Swanson [28], using an instrument measuring quality of program offerings, observed that under existing conditions, the optimum school district size ranged from 20,000 to 50,000 in total community population (approximately 5,000-12,500 pupil population).

A comprehensive review of studies of size/quality relationships was made by Educational Research Services, Inc. (ERS) in 1974 [27] on both school size and school district size. They concluded:

School district size, like school size, is not absolute; district size, too, is but one of many factors relating to educational quality and operational efficiency. Good education can and does occur in school districts ranging in sizes from small to large. Recommendations on district size in professional literature show the following ranges: minimum size—425 to 10,000; optimum size—9,800 to 50,000; and maximum size—10,000 to 40,000 (p. 49).

Twenty-six studies reviewed by ERS suggested a minimum district size. The median recommendation was 2,200 pupils. Nineteen studies were reviewed which suggested a minimum size for an elementary school; recommendations formed an approximately normal distribution with 300 pupils the median. The recommendations of the 53 studies of high school size formed a bi-modal distribution, suggesting that the researchers were operating under more than one set of assumptions. The lower mode was 400 pupils; the upper mode, 1200. The overall median was 500 pupils.

Accepting the central tendency of these recommendations as a conservative guide to policy [8], one would come up with a minimum school district size of about 1,500 pupils with a high school and a middle school of about 500 pupils each and two elementary schools of about 300 pupils each. The large high school option suggests a district of 4,000 to 5,000 pupils with a senior high school of 1,200 pupils, two or three junior high schools and eight elementary schools.

The studies reviewed by ERS date back to 1934. Several developments have taken place which may have made the older findings obsolete. The progress of centralization has eliminated virtually all of the one room school districts against which studies in the early part of the century were directed. The intermediate service district, a recent development, also strongly affects the magnitude of the recommendations; it makes a great deal of difference whether one is contemplating a comprehensive high school or an academic high school supplemented with a regional service center. This may account for the previously observed bi-modal distribution of high schools size recommendations. Knezevich [11, pp. 113-153], for example, recommended a minimum district size of 10,000 pupils; this drops to 2,400 if the district is part of an intermediate district.

Developing technology is another factor which may cause recommendations to change. It was the invention of the automobile and the improvement of rural roads which made massive consolidations feasible, if not necessarily desirable. The development of electronic media, including the computer as well as television, telephone, radio, and other telecommunications technologies have now made it possible to disseminate a variety of high quality instructional programs to a number of dispersed centers. Coupling these technological developments with emerging theories in individualized instruction and a greater use of community based resources may, in the future, greatly reduce the size of schools required to provide a satisfactory learning environment. [14, 20, 35].

DISCUSSION AND SUMMARY

The literature review suggests that the criteria adopted for an optimally sized school or school district have changed over time. Optimum size is a function of desired standards, available technology and governing structures.

The creation of regional service units has greatly lowered the minimum functional size of school districts by making it possible for a number of small districts to jointly provide services none could provide alone. Occupational education and education of the severely handicapped are examples. Regional centers also provide certain technological services with respect to educational television interactive video and computer assisted instruction; this involvement is likely to grow in the future.

Developments in educational technology have affected the definition of optimal school and school district size in the past and is likely to continue to do so in the future. The full potential of many technological developments such as educational television and computer services can only be realized through networking at the regional, state and national levels. While progress is being made, these developments have not yet had a major effect on the autonomous role of the school district in being solely responsible for providing instructional services. However, there is a trend toward individualization of instruction which can change this pattern. For decades, the educational community has been plagued by a conflict between its ideal of providing for individual needs, and the practice of standardization. School district consolidation has been based on the theory that individual needs can be met only by providing an increased number of standardized programs.

Studies of size have generally made an assumption that the variety of programs identified by separate classes truly measures diversity of opportunity for learning. This can be a fallacious assumption. Compare, for example, the one room school house to the comprehensive high school. In the one room school house, one teacher served 30 or more students at different grade levels and taught a variety of subjects. Older children helped younger children, and a great deal of the learning was done independently. The diversity in program was derived simply from the diversity of the children and the flexibility of the teacher. But one cannot say that because one teacher was grouped with 30 children that only one program existed.

With the comprehensive high school, however, the assumption is made that the greater the number of program offerings, the richer the program for the student. Yet, just the opposite may be true. With size comes specialization and more rigidly defined curricula. Learning becomes compartmentalized into departments and special topics or courses within departments. Once size forces departmentalization and specialization within programs, then organizational constraints do indeed require a greater number of programs to provide enrichment. A large school may offer more "pieces" of an educational program. But if the pieces are standardized, they may also be fragmented. When education is offered as a series of fragments, more fragments are indeed needed to build understanding of a broader picture. In this context, a greater variety of "programs" might be necessary for "quality" education. Powell et al. [21] have dubbed the resulting phenomenon *The Shopping Mall High School.*

Three trends appear to be emerging which are capable of creating a technology of individualization and completely altering the conception of the school and the definition of optimal size. First, a beginning has been made in the development of educational telecommunications networks and computer-assisted instruction. Second, there has been the development of curriculum planning resources and associated computer-based techniques for managing highly complex elements of curriculum, i.e., computer managed instruction (CMI). Both of these elements already permit a degree of individualization in the schools, and their use by school districts is increasing. The third factor needed to complete a technology of individualization is a theory of individualization which can be used as an organizing framework for curriculum planning.

With sufficient progress on all three fronts, regional service centers may eventually find themselves in the position of providing the technical support, and possibly raw materials for the conduct of district programs. At such a point, their relationship to the school and the school district would no longer be supplemental and/or specialized services, but would be integrally connected to the conduct of instruction itself. Such a development would further weaken any economies of scale to be realized by school district consolidation.

Research indicates that small schools are more personable and caring and that they do very well in teaching the basic skills of reading, writing and arithmetic. Given their present standardized organization, however, they have difficulty in meeting the needs of individual students—especially at the secondary level—because of fewer electives, scheduling problems created by single course offerings, and the lack of advanced courses. There is likely to be more teacher and administrative turnover in small schools and school districts than in larger ones. Teachers and administrators are likely to be less experienced and have less professional training. More teachers are likely to be teaching outside their certification areas.

The relationships between size and effectiveness and economy appear to be curvilinear, however. While there are disadvantages in being very small, there are also disadvantages in being very large. There is little agreement on an optimal size. The challenge before us is to provide stimulating learning environments with broad educational programs characteristic of large schools along with the supportive social structure characteristic of small schools. This should become easier to accomplish with the growing sophistication of instructional media.

The range of recommendations for optimal school size at the elementary level is narrower than at the secondary level. Here, the central tendency appears to be around 300 pupils and 12 teachers. At the senior high school level, assuming the availability of regional centers,

there appears to be some agreement on a minimum size of 400 to 600 students. For a complete K-12 program, this would suggest a minimum district size of between 1300 and 1900 pupils.

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