The Relationship of School Facilities Conditions To Selected Student Academic Outcomes:

A Study Of South Carolina Public Schools

2001

Prepared For:
Education Oversight Committee

Submitted By:
Kenneth R. Stevenson
Department of Educational Leadership and Policies
College of Education
University of South Carolina

Research Assistants:
Sarah Main
Julie Koon

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Executive Summary

This research project sought to determine if a relationship exists between school academic outcomes and school facilities characteristics. To address this issue, data were gathered from a variety of sources including research literature, state data files, principal questionnaires, and focus groups. The major findings of the study include:

- **The better a principal rates the physical condition and adequacy of his or her school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.**

- **The newer a school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.**

- **The larger a school, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.**

- **The higher the teacher and student attendance rate, and especially student attendance, the greater the likelihood that students score well on standardized achievement tests, though the socio-economic make up of the student body as measured by the portion of pupils on free or reduced lunch is heavily intertwined with this finding.**

- **Most principals believe that the condition and adequacy of a school facility has a significant impact on school academic outcomes. They view the relationship as very complex, indicating that facilities affect teacher attitudes, which in turn affect classroom productivity.**

- **One out of every five schools in this state is rated by the principal as having a direct negative impact on school productivity.**

- **Among facilities factors adversely affecting the educational process are overcrowding, poor physical condition of the structure, portables, lack of storage, inadequate laboratory space.**

- **Because a) this study affirms previous research indicating that school facilities affect student outcomes, b) one of every five schools in this state is rated as making a negative impact on the educational process, and c) the average school facility is 70% through its expected life cycle, it is recommended that a comprehensive and adequate system of funding school construction in South Carolina be developed and implemented.**

Introduction

As efforts to improve and enhance public education continue across the nation, educators and policy makers are examining a myriad of factors that may affect how well students learn in school. One area that is gaining considerable attention in this regard is the possible impact that the educational facility a student attends may have on enhancing or inhibiting the learning process. In the last decade growing numbers of studies have emerged indicating that, in fact, the school building a child attends can positively or negatively affect his or her educational attainment. These studies have identified such factors as size of the school, the physical environment of the facility, the age of the building, the availability of labs and special use spaces, and aesthetics as impacting on the learning and teaching process.

Recognizing that the condition of school facilities might be a factor in improving student outcomes in the State of South Carolina, the Education Oversight Committee authorized this study. The study is intended to provide to the Committee and the people of South Carolina data and information a) with which to judge the impact of school facilities on educational outcomes and b) from which decisions may be made regarding addressing the facilities needs of the state as they relate to improving the learning and teaching environment.

In conducting the study the researcher sought information regarding the relationship of school facilities to student outcomes from a variety of sources. Initially, an extensive review of the literature was conducted. Particular emphasis was placed on identifying actual research studies that focused on assessing the connection between student performance and the physical characteristics of schools. A summary of the research collected is presented in the following section of this report.

Using the information gathered from the review of research and literature, the author then developed a comprehensive questionnaire that included the major facilities factors that had been identified in the literature as possibly having a relationship to school outcomes. The instrument asked principals to assess the extent to which various school physical characteristics impact on the educational process in general, and on their own schools specifically. Principals also were asked to provide specific comments and/or examples regarding how facilities related to the schooling process. This questionnaire was mailed to every public school principal in the state. The findings from the questionnaire follow the literature review section of this report.

While the process of securing principal input through the questionnaires was occurring, the researcher gathered state-wide data that were available for all schools to make an initial assessment of the relationship of school outcomes to facilities factors. At the high school level, the average SAT score for each school was obtained. For elementary and middle schools, PACT test results for grades three through eight were collected. Then, for each school, using available state data files, the age of the physical plant, teacher and student attendance patterns, and the student population size of each school were gathered. Subsequently, the researcher ran a series of statistical tests to ascertain if relationships existed between a) age of school and student academic success, b) size of school and test performance, and c) teacher and pupils absences compared to student outcomes. The findings from this analysis are provided after the section summarizing the findings from the questionnaire.

After the principal questionnaires were returned and analyzed, the researcher examined the responses to determine if patterns emerged between how principals rated the physical condition and adequacy of their schools and such factors as teacher and pupil attendance, age of school, school size, and student outcomes. The survey data were further examined to determine if

relationships existed among student outcomes and other factors studied, including the principal's building rating, when controlling for the effects of socio-economic impact. The findings from these analyzes are included in a later section of this report.

Subsequently, when examination of questionnaire and test data were complete, the researcher conducted three focus group sessions with selected principals from across the state. Each of these meetings centered on a specific grade level grouping - elementary, middle, and high. Principals were asked to discuss their experiences as they related to the impact of facilities factors on teaching and learning. Their input was noted and, along with written comments provided by principals completing the questionnaire, are summarized near the end of this report.

Finally, using the various data sources available, the researcher presents in the last section of this document a set of conclusions, along with a discussion of the findings. These are intended to provide the Committee, as well as policy makers and the public, with "food for thought" regarding how the information might be used, what actions should be considered, and what additional information and/or research may be needed.

Summary of Research Literature on the Relationship of School Facilities to Educational Outcomes, Structure, and Organization

Overview

The review of research studies on the impact of school facilities on the educational process confirmed that there is a growing body of literature documenting that classroom outcomes are related to school physical environment. Interestingly, the relationship appears to be multidirectional. In some instances (Berner, 1993) it has been shown that local socio-economic conditions and level of parent involvement in the schooling process influence the condition of school buildings. Conversely, other studies have revealed that the physical factors affect outcomes, attitudes, and community support (Chan, 1996; Earthman, 1996; Maxwell, 1998; etc.). Stated differently, the literature suggests that physical environment impacts on outcomes, but the physical environment also can be affected by community economic conditions and level of community involvement in a school.

Physical Environment and Outcomes

The impact of school facilities can be examined from at least two different perspectives. First, do factors within the physical environment affect school outcomes? In other words, does the condition of a school have any bearing on or relationship to the general development and/or academic performance of students? This is a basic and important question. The literature does affirm that environmental conditions in classrooms and health/safety factors can affect a student's academic progress and social development (Lackney, 1999). Also, the impact of physical environment can be highly significant. For example, Berner (1993), studying schools in

Washington, D.C. found that the classification of schools by physical condition related directly to how students in those schools scored on achievement tests (CTBS). Her data revealed that,

> As a school moves from one category to the next, such as poor to fair, average achievement scores can be expected to increase by 5.455 points. If a school were to improve its conditions from poor to excellent, we could predict an increase of 10.9 points in the average achievement scores. (p. 23)

Other Facilities Factors Affecting School Outcomes

Second, the structure of a school (or its ability to house programs in certain configurations) can impact on learning outcomes and general development of students. Research has explored the relationship of student achievement and school size (Cotton, 1997; Stevenson, 1996), the influence of class size on school outcomes (Achilles, 1996), the effect of school location on physical well-being of students (Moore, G., 1994), the impact of classroom design and layout on student behavior (Burgess, 1989), and the relationship of grade configuration to learning outcomes (Renchler, 2000). In each of these cases, researchers have concluded that the school facility, and/or its ability to support educational configurations, in some way affects student outcomes.

Cotton (1997), after completing a meta-analysis of studies on school size and student achievement, summarized the research as follows:

> ...whereas the research finds that small schools produce equal or superior achievement for students in general, the effects of small schools on the achievement of ethnic minority students and students of low socio-economic status are the most positive of all. (p. 6)

Interestingly, Stevenson (1996), reporting the results from a study in South Carolina of the relationship of elementary school size to outcomes, to some extent, but not entirely, supported Cotton's conclusions. While Stevenson did not find that smaller schools in general performed as well as larger schools, he did note one exception.

> Conversely, though, the trend line for the Category 1 schools [lowest socio-economic level] indicated a negative, though not significant, relationship between wins [receiving a state incentive award] and school size. (p. 12)

Achilles, after conducting a major longitudinal study in Tennessee on the effects of reducing teacher/pupil ratios, concluded that:

> ...results show that in 8th grade, students who had small classes in grades K-3 remain significantly ahead of those who were in regular classes. On average, poor districts participating ... have moved from well below to somewhat above the state average performance in 3rd grade reading and math scores as they have reduced class sizes. (p. 3)

Gary Moore (1994), after reviewing studies on school physical planning and design, reported that several different researchers had found that students in schools located in noisy educational settings experience significant increases in blood pressure levels. The studies further indicated that high noise levels from industry, nearby traffic, etc. caused reduced mental concentration, increased errors on difficult tasks, and increased the tendency to give up on assignments before they were complete. Moore concluded:

> While blood pressure, concentration, and task persistence are neither academic achievement nor prosocial outcomes, they are important mediators of educational outcomes. (p. 10)

Burgess (1989), after reviewing related literature, conducted his own detailed study of the effects of physical environment, particularly amount of available classroom space, on student behavior. In comparing his findings to previous research, he concluded:

> This effect [Burgess' findings] is consistent with studies of artificial crowding which employed much higher densities: in these studies high density crowding produced closer distances and less social behavior than "normal" or "uncrowded" conditions. (p. 271)

Further, Renchler (2000) recently reviewed the literature and research on the relationship between grade spans found in a school and educational outcomes. Highlights from the research literature include: a) the more school-to-school transitions (times a student moves from school to

school across grades) students experience, the more likely they are to suffer academic loss during the transition year; b) middle schoolers in certain grade configurations outperform those in schools with a different grade grouping pattern; c) the earlier the grade at which students make the transition to high school, the less likely they are to drop out; and d) the performance of sixth graders on mastery tests are better when the sixth grade is part of a K-6 configuration.

Conclusions From the Literature

The growing body of research literature on the relationship of school outcomes and school facilities strongly suggests that as South Carolina explores ways to improve student achievement, it must take into consideration the condition and configuration of its school facilities. As research studies point out, the physical structure and condition of a school can impact on educational productivity in a variety of ways. Crowded conditions negatively affect behavior. Noisy classrooms adversely impact on student blood pressure and reduce concentration. Schools that are physically "run-down" produce lower test scores than schools that are in good condition. Schools that have insufficient space to reduce teacher/pupil ratios cannot expect to reach the same levels of academic achievement as those that can. Furthermore, if schools are overly large and physically designed so that "smaller within larger" cannot be achieved, they will experience greater problems with discipline and, possibly, produce lower student academic performance than expected. Finally, if the configuration of a school facility does not support certain grade level groupings, academic performance of students may well be adversely affected.

The literature very convincingly makes the case that school outcomes are tied to physical conditions in schools. However, little research is available in this whole area as it relates to South Carolina. Thus, the next logical steps appear to be to a) affirm the physical condition of

school facilities in South Carolina, b) assess the educational impact that school personnel attribute to those conditions, and c) determine as far as practical through data analysis what relationships exist in South Carolina between academic and pro-social outcomes and identified school conditions.

The remainder of this report seeks to provide at least initial data and insight into these three issues. The following sections present findings from data analysis on school facilities related issues directly applicable to South Carolina.

In a separate document, a extensive bibliography of research work in the area of school facilities as related to educational impact is presented. This bibliography was developed to provide background and direction for the present study. A complete reference list that was used to create that bibliography can be found at the end of this report.

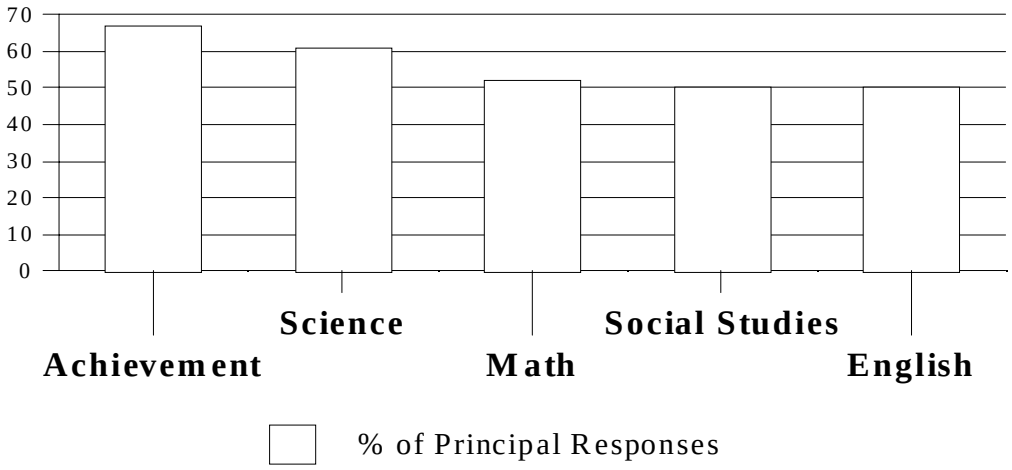
Findings From The Principal Questionnaire On The Relationship Of School Facilities Factors To School Outcomes

As part of the process of studying the relationship of school facilities to academic outcomes, all public school principals (approximately 1100) in South Carolina were sent a questionnaire requesting their input regarding various questions and statements related to the topic. The questionnaire content was developed after an extensive review of related literature and research. A majority (626) of the principals completed and returned the questionnaire. What follows is a summary of their responses.

Do School Facilities Have An Impact On Student Achievement In General?

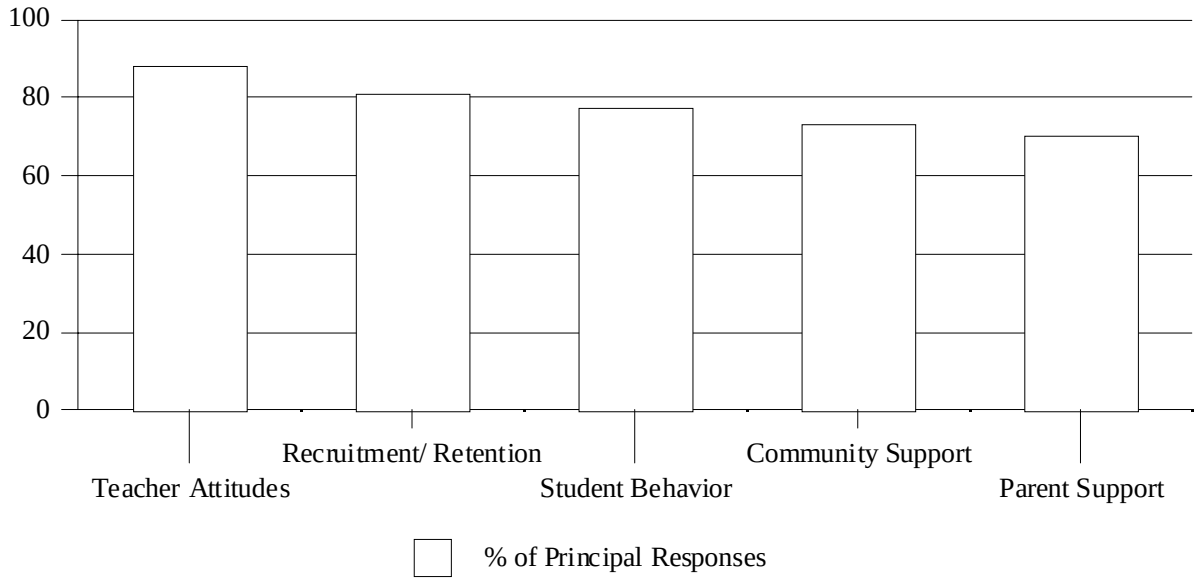
Based on their experiences, principals were asked whether there is a relationship between school outcomes and the condition of facilities in which education occurs. Two-thirds (67%) of those responding indicated that the school facility has a **significant** impact on school achievement. When asked specifically about the relationship of school buildings to specific basic academic areas, the one factor the greatest number of principals (61%) identified as being significantly affected by educational facilities was science. However, at least half also felt that the condition of school building significantly influenced outcomes in mathematics (52%), English (50%), and social studies (50%).

Impact Of School Facilities On Achievement Outcome Measures:
Percent Reporting "Significant"



Principals were also asked to rate the impact the condition of school facilities has on factors influencing achievement. The factor that was identified by more principals than any other as significantly affected by the condition of a school facility was teacher attitudes (88%). Closely following was teacher recruitment and retention. Eighty-one percent (81%) of the principals indicated that facilities significantly affected attracting and retaining instructional staff. Over three-fourths (77%) also replied that student behavior was significantly impacted by school facilities. Only slightly fewer (73%) felt that facilities impacted significantly on community support. Approximately 70% saw a significant relationship between school facilities and parent support.

Impact Of School Facilities On Factors Influencing Achievement:
Percent Reporting "Significant"



Do School Facilities Have An Impact On Student Achievement In Your School?

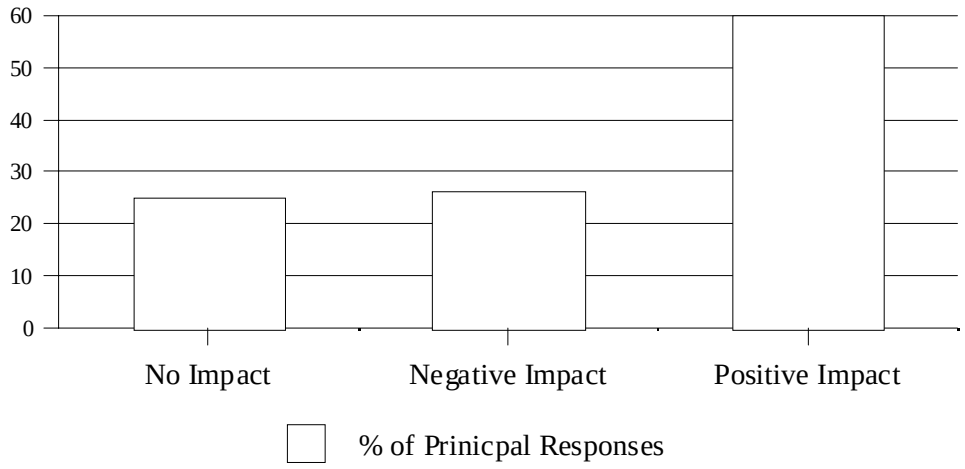
After principals provided their views about the general impact of school facilities on school outcomes, they were asked to address the condition of facilities as a factor in delivering education at their own schools. The principals addressed questions in four distinct categories: General impact of school facilities on your school; Impact of school facilities on instruction; Impact of school facilities on organization for instruction; and Impact of facilities on the support systems of the school. Each of these is addressed below.

General Impact Of School Facilities On The Principal's School

Principals were asked to rate the impact of school location, the school site itself, the site layout, school size, building layout, building appearance, and physical condition of buildings on

various school components and school constituent groups. On average about one-fourth of the principals responded that at their own schools facilities location, site, site layout, building layout, building appearance, and physical condition were having no impact (positive or negative) on the school's constituent groups or programs. However, four factors were identified by at least one-fourth of the principals as having a negative effect on their schools. These principals indicated that physical condition of their schools was negatively affecting faculty (26%); that building layout was negatively affecting faculty (26%); that building layout was negatively affecting students (26%); and school size was negatively affecting faculty (25%).

Impact Of School Facility Physical Condition On School's Constituent Groups And Programs: Principals' Responses



Conversely, four facilities factors were identified by at least 60% of the principals as making a positive impact on their own school constituents or programs. Sixty-eight percent of the principals indicated that the appearance of their building was positively affecting parents and the community. Almost that number (66%) stated that the building appearance was having a

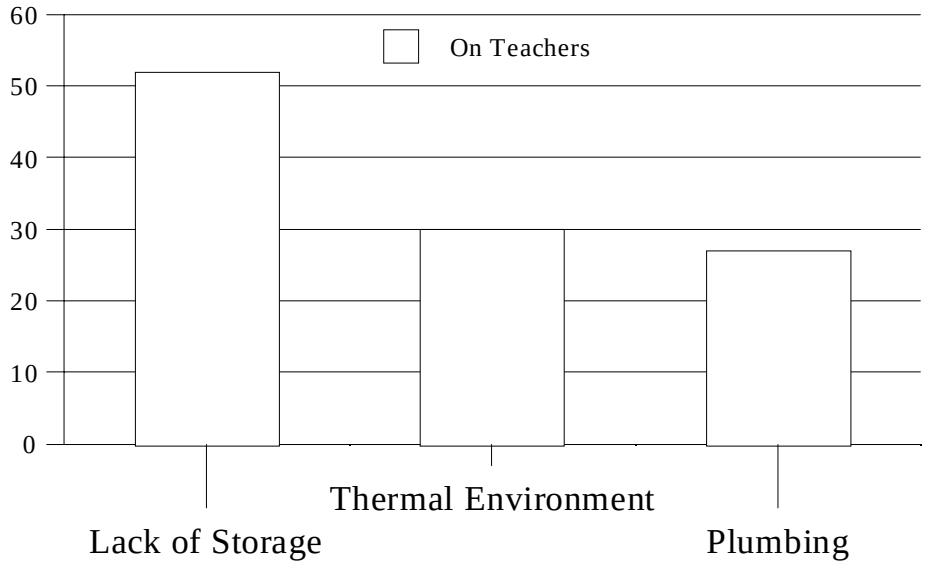
positive effect on faculty. Sixty-five percent responded that building appearance at their school was having a positive impact on students. Finally, a considerable percentage of principals (61%) felt that the physical condition of their school positively impacted on parents.

The Impact Of Physical Support Systems On The Principal's School

School principals were asked to rate the impact of various physical support components of their own school buildings on programs and constituent groups. Topics addressed included lighting, thermal environment, acoustics, electrical service, technology, safety and security, storage, and communication. An average, approximately 25% of the principals responded that the support components were having no effect, negative or a positive, on school programs and constituents. However, an notable expectation to this was storage. Fifty-two percent felt that lack of storage space was adversely affecting faculty.

Storage for teachers, however, was not the only support system that a number of principals rated as having a negative impact in their own schools. In all, at least 25% of the principals responding to the survey rated eight support factors as negatively affecting their school programs or constituents. The eight factors and the percent of principals rating them as negatively impacting on programs or constituents at their schools were: lack of storage is affecting teachers (52%), lack of storage is affecting students (41%), lack of storage is affecting the curriculum (40%), lack of storage is affecting parents and community (31%), the thermal environment (heating and cooling) is affecting teachers (30%), the thermal environment is affecting students (29%), plumbing (number of rest rooms, fixtures, etc.) is affecting students (27%), and plumbing is affecting faculty (27%).

Physical Support Systems Most Negatively Affecting Teachers:
Percent Of Principals Indicating Problem



Only three support factors were rated by at least 60% of the principals as having a positive effect on programs and constituents. All of these had to do with technology. Approximately 62% of the responding principals indicated that the technology infrastructure at their school was having a positive effect on each of the following: Students, faculty, and the curriculum.

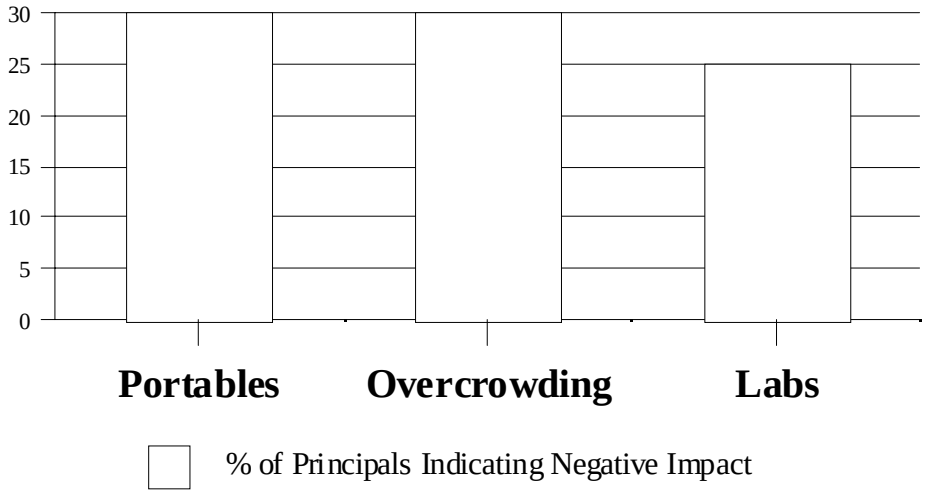
In general, support factors that, according to principals, tended to enhance learning and teaching in their schools were the physical condition of building components and the technology support system. Factors that tended to be negatively affecting schools were the physical environment, the layout of the facility, the size of the school, and lack of storage.

The Impact Of Instructional Support Systems On The Principal's School

Principals answering the questionnaire were then asked to indicate the extent to which instructional support systems were impacting on the programs and constituents in their own schools. Factors principals were asked to respond to included: Permanent labs; Permanent classrooms; Classroom size; Overcrowding; and Portables. A considerable majority (approximately 60%) of the responding principals rated the instructional support systems at their schools in general as having a positive impact on program and constituents.

However, there were some factors that at least 25% of the principals considered to be negatively impacting on their programs and/or constituents. The instructional support factor that was most often rated as a negative factor was use of portables. On average nearly 30% of the principals indicated that use of portables was adversely affecting their schools. Groups or factors adversely affected included students, faculty, the curriculum, and relations with parents and community. Approximately the same percentage (30%) indicated that overcrowding was a problem that was negatively affecting students, faculty, and the curriculum at their school. The other instructional support component adversely affecting schools was lack of permanent lab space or poor lab space. Approximately one-fourth (25%) of the principals responded that both students and faculty were negatively affected by lab conditions.

Factors That Have The Largest Negative Impact On School Programs And/Or Constituents, Instructional Support Systems: Percent Principals Reporting Problem



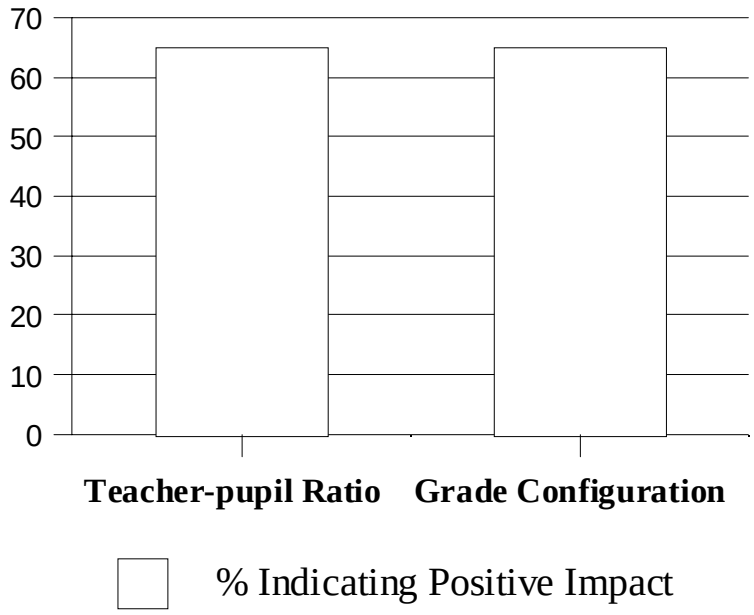
The Impact Of Instructional Organization On The Principal's School

Principals were subsequently asked to rate the impact of school organizational components on school programs and constituents. The two factors they were asked to considered included: Teacher-pupil ratio and Grade configuration.

Almost two-thirds of the responding principals (about 65%) indicated that the teacher-pupil ratio at their schools was making a positive difference on students, faculty, parents and community, and on the curriculum itself. However, approximately 20% responded that teacher-pupil ratios were having a negative effect on their schools.

A large majority of principals (about 65%) felt that the grade configuration of their schools was having a positive effect on programs and constituents. Only about 5% indicated that grade configuration was having a negative impact on their programs, students, teachers, or community.

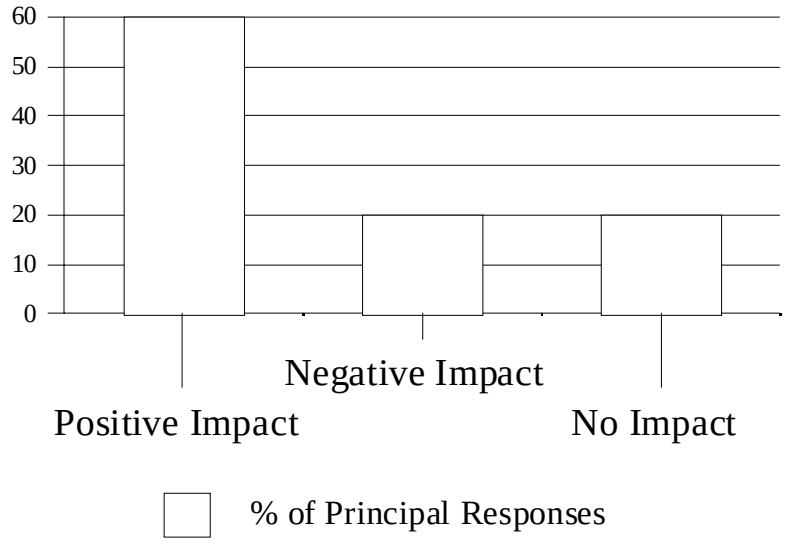
Impact Of Teacher-Pupil Ratio And Grade Configuration On Students, Faculty, Parents And Community, And Curriculum: Percentage Of Principals Indicating "Positive"



Overall Impact Of The Principal's School Facility On His/Her School

To ascertain the overall impact of the above factors on the educational process at individual schools, principals were asked to rate whether their school facilities affected students, parents and community, faculty, and the curriculum. In each of these cases, approximately 60% of the principals surveyed said their school facility had a positive impact. However, another 20% felt that their facilities were negatively impacting people and the program. While this is considerably fewer than the number responding positively, it indicates that approximately one in five principals in public schools in South Carolina believed they were having difficulty meeting program demands and human needs because of the facility in which schooling must occur.

Overall Impact Of School Facility:
On Students, Parents And Community, Faculty, And Curriculum



Summary

A large majority of public school principals throughout South Carolina believed that a relationship exists between the condition of a school facility and what a school can be expected to produce. Further, almost all principals responding to the questionnaire indicated that school facilities conditions were having some impact on their own schools, either positively or negatively, as they sought to optimize student achievement. A majority of principals felt that their own school facilities were positively impacting on the ability to effectively educate students. However, twenty percent indicated that their school facility was a detriment to effectively delivering instruction. Physical factors often identified by principals as positively affecting instruction included building appearance, the physical condition of the structure, the technology system, and the availability of appropriate labs and classrooms. Physical factors

most often identified as negatively affecting the educational process were, lack of storage, physical condition of the building, the layout of the school, the size of the school, portables, overcrowding, lack of appropriate lab space, and the teacher-pupil ratio.

Relationship Of School Outcome Measures To School Age, Size, And Attendance

As part of the state-wide research into the question of the relationship of school facilities to student outcomes, the study sought to determine if there is a link between standardized test scores and the independent variables of school age, school size, and pupil and teacher attendance. These variables regularly appear in the literature as ones that could influence educational outcomes. In addition, data on all four factors were available for all public schools in South Carolina. The analysis was done at the elementary, middle, and high school levels, and included all public South Carolina schools for which age, size, attendance, and test data were available. At the high school level the outcome measure used was the average SAT score for each high school. For the middle and elementary schools, scores on the PACT tests in reading and mathematics were used. The results of the various analyses are presented below.

High Schools: Relationships Among SAT Scores, School Age, School Size, and Attendance

There were 168 South Carolina public high schools for which data were available and analyzed. Their students averaged scoring 933 on the SAT. Average daily membership among these high schools was 1028 students. The mean age of the 168 schools was 34 years. On average 40% of the students at these high schools were on free or reduced lunch.

Initial independent analysis indicated that the average SAT score for a high school was significantly related to all the other factors studied. At bigger and newer schools, with higher teacher and student attendance, students scored better on the SAT.

Variables In Isolation Related To SAT Outcomes:
High School SAT Scores

Factor	**Effect**
School Age	Significant
Teacher Attendance	Significant
School Size	Significant
Student Attendance	Significant

However, when the socio-economic level of the population of students served by the various high schools was taken into account, all but one of the effects disappeared. By far, the most critical indicator in predicting academic success as measured by the SAT was the percentage of students who were on free or reduced lunch. Fifty-nine percent of the variation in the average SAT scores among high schools could be accounted for by the socio-economic status of the student body. However, student attendance also emerged as a statistically significant factor in predicting test results. Though its impact was small compared to the effect of free and reduced lunch, it did have predictive validity. In fact, the combined effects of free and reduced lunch and student attendance accounted for sixty-two percent of the variation among the average SAT test results among high schools. The impact of the effect of the overall socio-economic status of a high school's student body as measured by free and reduced lunch was so staggering that the other factors (age of building, teacher attendance, and school size) lost significance when SES was included in the calculations.

Proportion Of Variation In Dependent Variable Accounted For By Independent Variables:
High School SAT Scores

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.767**	**.589**	**.587**	**54.67**
Student Attendance*	**.787**	**.620**	**.615**	**52.73**

*Includes the SES Effect

Middle Schools:
Relationship Among PACT Results, School Age, School Size, And Attendance

The PACT scores of schools serving grades 6, 7, and/or 8 were analyzed in relationship to school age, school size, and student and teacher attendance. For the PACT analysis the percentages of students scoring in the proficient and advanced categories at each school in math and English were the dependent variables. Between 227 and 286 schools, depending on the grade level studied, comprised the sample for this part of the analysis. These schools, containing grades 6, 7, and/or 8, were, on average, 37 years old. The mean size of these schools was 651 students in average daily membership. Approximately 56% of the students qualified for either free or reduced lunch. In general, when the above factors were analyzed in relation to school performance in isolation a significant relationship was found.

Variables In Isolation Related To
PACT Outcomes Middle School PACT Scores

Factor	Effect
School Age	Significant
Teacher Attendance	Significant
School Size	Significant
Student Attendance	Significant

English

Initial independent analysis of the sixth grade PACT English test data revealed a statistically significant relationship between the percentage of students scoring proficient or advanced and all of the other factors studied. As was the case with high schools, larger middle-grades schools, that were newer in construction, and in which student and teacher attendance were higher, generated greater percentages of students scoring proficient or advanced on the sixth grade PACT English test.

However, when the socio-economic level of the population of students, as measured by the portion of students on free and reduced lunch, served by the middle-grades schools was taken into account, the effects of all but one factor disappeared. Again, as was the case in the high school analysis, the most critical factor in predicting English achievement in the sixth grade as measured by PACT was the percentage of students who were on free or reduced lunch. Forty-five percent of the variation in the portion of middle-grades students scoring proficient or advanced in sixth grade English could be accounted for by the socio-economic status of the student body. However, student attendance also emerged as a statistically significant factor in predicting test results. Though its impact was small compared to the effect of free and reduced lunch, it did have predictive validity. In fact, the combined effects of free and reduced lunch and student attendance accounted for approximately forty-nine percent of the variation among the average PACT test results among sixth grade English scores. The impact of the effect of the overall socio-economic status of a high school's student body as measured by free and reduced lunch was so large that the other factors (age of building, teacher attendance, and school size) lost significance when SES was included in the calculations.

Proportion Of Variation In Dependent Variable (Grade 6 English)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.674**	**.455**	**.453**	**11.2965**
Student Attendance*	**.701**	**.492**	**.488**	**10.9221**

*Includes the SES Effect

Very similar results were found after analyzing the results of the PACT English tests for seventh graders. When looked at independently, newer schools and schools with larger student bodies, with higher student attendance rates, were associated with larger percentages of students scoring proficient or advanced on the seventh grade English test. At the seventh grade level, however, teacher attendance patterns were not independently associated with English score results. As was sixth grade English scores, when the socio-economic factor was applied to the analysis, it again impacted on the effects of the other factors. The percentage of students on free and reduced lunch was associated with 36% of the variability of seventh grade English scores across schools. Though this is a somewhat small effect than found at the sixth grade, it is by far the largest predictive factor. In fact, only one other variable, student attendance, continued to have a statistically significant relationship to school PACT English outcomes. When combined student attendance was combined with SES, or number of students on free and reduced lunch, forty-one percent of the variation in seventh grade English scores across schools on PACT could be accounted for.

Proportion Of Variation In Dependent Variable (Grade 7 English)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.599**	**.359**	**.356**	**10.9559**
Student Attendance*	**.644**	**.415**	**.410**	**10.4870**

*Includes the SES Effect

Slightly different, but not inconsistent, findings resulted from the examination of eighth grade PACT English results. As before, newer schools with better student attendance, when excluding the effect of socio-economic status, were associated with greater percentages of students in eighth grade scoring well in English. However, even in independent analysis, neither size of school nor teacher attendance patterns was associated with differences among schools. When the portion of students on free or reduced lunch was then factored in, the initial effects of age (newer facilities) disappeared. This was not the case with the student attendance factor. It continued to have some predictive validity related to what percentage of students at a school would score proficient or advanced in English at the eighth grade level. By far, the greatest predictor of school scores continued to be the socio-economic status of students, with SES accounting for 28% of variation among schools. Interestingly, though, adding student attendance patterns of schools to the equation did increase the combined predictive factor slightly, but significantly, to 35%.

Proportion Of Variation In Dependent Variable (Grade 8 English)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.533**	**.285**	**.281**	**11.0400**
Student Attendance*	**.592**	**.351**	**.345**	**10.5387**

*Includes the SES Effect

Mathematics

The relationship of PACT mathematics results for grade 6 to school age, school size, and attendance patterns was very similar to that found with English. Newer and larger schools, with better students and teacher attendance rates, were associated with greater percentages of students scoring proficient or advanced on PACT, when examined independently. However, when SES was factored in, the portion of the student body on free or reduced lunch accounted for 38% of the variation in sixth grade PACT mathematics results. This impact erased, or nullified, the effects of school age, school size, and teacher attendance patterns. However, student attendance continued to maintain a statistically significant relationship to PACT sixth grade math results. When it was considered in conjunction with SES, or number of students on free and reduced lunch, 41% of the variation among schools could be accounted for.

Proportion Of Variation In Dependent Variable (Grade 6 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.616**	**.380**	**.378**	**11.2579**
Student Attendance*	**.647**	**.418**	**.414**	**10.9250**

*Includes the SES Effect

Slightly different, but not inconsistent, findings were found when examining seventh grade PACT mathematics results. As with the sixth grade, newer schools, with better teacher and student attendance rates were associated with greater percentages of students in seventh grade scoring well in mathematics, when excluding the effects of socio-economic status. However, school size was not significantly related to seventh grade math results, even when considered independent of other factors. Again, when the portion of students on free or reduced lunch was factored in, the initial impact of school age and teacher attendance disappeared. This was not the case with student attendance. Student attendance continued to have some predictive validity related to what percentage of students at a school would score proficient or advanced in mathematics at the seventh grade level. The greatest predictor of school scores continued to be the socio-economic status of students, with the number of students on free and reduced lunch accounting for 29% of variation among schools. Interestingly, adding student attendance patterns to the equation increased the combined predictive factor slightly, but significantly, to 34%.

Proportion Of Variation In Dependent Variable (Grade 7 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.540**	**.292**	**.289**	**11.2456**
Student Attendance*	**.588**	**.346**	**.340**	**10.8307**

*Includes the SES Effect

Analysis of eighth grade PACT mathematics scores produced slightly different findings than observed at the sixth or seventh grades. Initial independent analysis indicated a relationship between eighth grade PACT mathematics results and school age, school size, and student and

teacher attendance. When the effect of socio-economic status was taken into account, the effects of teacher attendance patterns and school size disappeared. The number of students on free or reduced lunch alone accounted for about 25% of the variability among the test results in mathematics among schools housing that grade. In addition, however, student attendance patterns and age of the school facility had a statistically significant relationship to math performance in the eighth grade. When SES and student attendance were combined, they accounted for 29% of the variation among school test results. When school age was added to these, 30% of the variation in eighth grade PACT mathematics differences among schools could be accounted for.

Proportion Of Variation In Dependent Variable (Grade 8 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.500**	**.250**	**.247**	**10.7726**
Student Attendance*	**.542**	**.294**	**.288**	**10.4755**
School Age**	**.557**	**.311**	**.302**	**10.3727**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

Elementary Schools:
Relationship Among PACT Results, School Age, School Size, And Attendance

The PACT scores of schools serving grades 3, 4, and/or 5 were analyzed in relationship to school age, teacher and student attendance, and school size. For the PACT analysis the percentages of students scoring in the proficient and advanced categories at each school in math and English were the dependent variables. There were from 506 to 534 schools containing grades 3, 4, and/or 5, depending on the grade level being studied. These school were, on

average, 36 years old. The mean size of these schools serving the elementary grades was 539 students in average daily membership. Approximately 59% of the students qualified for either free or reduced lunch. In general, when the above factors were analyzed in relation to school performance in isolation a significant relationship was found.

Variables In Isolation Related To PACT Outcomes: Elementary Grades

Factor	**Effect**
School Age	Significant
Teacher Attendance	Significant
School Size	Significant
Student Attendance	Significant

English

An examination was made of the relationship of the portion of students falling in the PACT categories of proficient or advanced at a school and the size, attendance patterns, and age of the school. When examined independently, all of the variables had a statistically significant relationship to English proficiency in the third grade. Students in newer and larger schools, with better teacher and student attendance patterns, performed better. However, when socio-economic status, as measured by the percentage of students on free and reduced lunch, was included in the analysis, the effects of age, size, and teacher attendance patterns disappeared. The percentage of students on free and reduced lunch was an extremely powerful factor in determining how schools would score on the test at this grade level. It alone accounted for

nearly 63% of the variability of scores across schools. Nonetheless, the student attendance factor, though small, did contribute to predicting how third graders would perform on the English portion of the PACT examination. Knowing both the percentage of students on free or reduced lunch and the student attendance rate raised the predictive value slightly, but significantly, to 64%.

Proportion Of Variation In Dependent Variable (Grade 3 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.793**	**.629**	**.629**	**10.337**
Student Attendance*	**.799**	**.639**	**.638**	**10.212**

*Includes the SES Effect

A similar examination was made at the fourth grade level of the relationship between the portion of students falling into the PACT categories of proficient or advanced in English at a school and the size and age of the school facility, and teacher and student attendance rates. When studied independently, all of the factors again had a statistically significant relationship to English proficiency in the fourth grade. Students in newer and larger schools, with better teacher and student attendance patterns, performed better. However, when socio-economic status was included in the analysis, the effects of school size and of teacher attendance disappeared. The percentage of students on free and reduced lunch was an extremely commanding factor in determining how schools would score on the test. It alone accounted for nearly 66.8% of the variability of scores across schools at grade four. Nonetheless, both school age and student attendance added in a statistically significant manor to predicting schools' fourth grade PACT English scores, though the impact was slight. Combined, SES and student attendance accounted

for 68% of the variability among schools. When school age was added this figure increased to approximately 68.4%.

Proportion Of Variation In Dependent Variable (Grade 4 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.818**	**.669**	**.668**	**9.400**
Student Attendance*	**.825**	**.681**	**.680**	**9.231**
School Age**	**.828**	**.686**	**.684**	**9.167**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

Analysis of PACT English scores for grade 5 was then carried out to ascertain the relationship between the portion of students falling in the categories of proficient or advanced at a school and the size and age of the school facility, and its teacher and student attendance patterns. When studied independently, each again had a statistically significant relationship to English proficiency in the fifth grade. Students in newer and larger schools, whose students and teachers were absent for fewer days, performed better. However, when socio-economic status was included in the analysis, the effects of everything but student attendance disappeared. The percentage of students on free and reduced lunch continued to be an extremely influential factor in determining how schools would score on the test. It alone accounted for 65% of the variability of scores across schools. Nonetheless, the student attendance factor, though small, did make a statistically significant contribution to predicting how fifth graders would perform on the English portion of the PACT examination. The two together accounted for 66% of the variation among school scores.

Proportion Of Variation In Dependent Variable (Grade 5 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.807**	**.651**	**.650**	**9.100**
Student Attendance*	**.812**	**.659**	**.658**	**9.001**

*Includes the SES Effect

Mathematics

Analysis of PACT mathematics scores for grade 3 was conducted to determine if school size, age of school facility, or student and teacher attendance patterns were related to percentage of students taking the tests who were scoring proficient or advanced. When examined independently, all factors had a statistically significant relationship to mathematics proficiency in the third grade. As was the case in other analyzes, students in newer and larger schools with better student and teacher attendance patterns tended to have more students scoring proficient or advanced on the PACT third grade mathematics test. However, when socio-economic status was included in the analysis, the effects of all the factors other than student attendance rate disappeared. The percentage of students on free and reduced lunch was a powerful factor in determining how schools would score on the test. It alone accounted for nearly 53% of the variability of scores across schools. Nonetheless, the student attendance factor, though small, did contribute to predicting how third graders would perform on the mathematics portion of the PACT examination. The combination of knowing the percentage of students on free or reduced lunch and the average number of days students were absent from school accounted for 55% of

the variability among schools in terms of the percentage of students scoring proficient or advanced on the third grade PACT mathematics examination.

Proportion Of Variation In Dependent Variable (Grade 3 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.730**	**.533**	**.532**	**10.749**
Student Attendance*	**.745**	**.555**	**.553**	**10.500**

*Includes the SES Effect

A similar analysis of PACT mathematics scores for grade 4 was done. It examined the relationship between the portion of students falling in the proficient and advanced categories at a school and the size of the pupil population, age of the school, and student and teacher attendance patterns. Again, when studied independently, all of these factors had a statistically significant relationship to mathematics proficiency in the fourth grade. Students in newer and larger schools with fewer teacher and student absences performed better. However, when socio-economic status was included in the analysis, the effects of school age and teacher attendance disappeared. The percentage of students on free and reduced lunch remained a powerful factor in determining how schools would score on the test. It alone accounted for nearly 56.6% of the variability of scores across schools. However, both student attendance pattern and size of school did contribute at a statistically significant level in predicting PACT fourth grade test results. When student attendance rate was combined with the portion of students on free and reduced lunch, 57.9% of the score variability among schools was accounted for. Including school size in the mix increased predictability slightly to 58.2%

Proportion Of Variation In Dependent Variable (Grade 4 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.753**	**.567**	**.566**	**10.059**
Student Attendance*	**.762**	**.580**	**.579**	**9.913**
ADM**	**.764**	**.584**	**.582**	**9.880**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

Analysis of PACT mathematics scores for grade five completed the examination of the relationship of school age, population size, and attendance patterns to student outcomes. Without controlling for other variables, once more each factor had a statistically significant relationship to mathematics proficiency in the fifth grade. Students in newer and larger schools with fewer teacher and student absences performed better. However, when socio-economic status was included in the analysis, the effects of all factors except student attendance again disappeared. The percentage of students on free and reduced lunch continued to be a very strong factor in determining how schools would score on the test. It alone accounted for over 58.4% of the variability of scores across schools. Nonetheless, the student attendance factor, though small, did contribute to predicting how fifth graders would perform on the mathematics portion of the PACT examination. When the SES and student attendance factors were combined, 60.3% of the variability among schools was accounted for.

Proportion Of Variation In Dependent Variable (Grade 5 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.765**	**.585**	**.584**	**9.400**
Student Attendance*	**.777**	**.604**	**.603**	**9.186**

*Includes the SES Effect

Summary

Analysis of the state-wide data comparing school academic outcomes to age of school facility, number of students served by a school, and student and teacher attendance patterns revealed several interesting and important findings. First, when examined independently, school facilities-related factors had a relationship to student performance.

Second, however, as previous studies have revealed, the socio-economic status of a child is an extremely strong predictor of the success that child will have in school. In this study, the SES factor was so great it tended to "wash out" the effects of other variables. In South Carolina the relationships among school factors, student outcomes, and effects of social class are so intertwined, that, to a large extent, separating the effect of facilities is difficult. Students in older, smaller schools scored poorer on tests. Students and teachers in these schools attended less often. However, these schools also housed the largest portions of students living in poverty.

Third, even after factoring in the effect of poverty, some variables remained strong enough to make a difference in predicting school performance. Student attendance in particular regularly emerged as a significant factor in predicting how students at a school would perform. Periodically, school age and school size also emerged as significant indicators of student performance despite the large impact of socio-economic status.

Factors That Were Found To Be Significant In Predicting Test Results When Factoring In The Effect of Percentage Of Students On Free or Reduced Lunch: State-Wide Sample

		SES	Age	School Size	Student Attendance	Teacher Attendance
High	**SAT**	Significant			Significant	
Middle - English	**Grade 8**	Significant			Significant	
	Grade 7	Significant			Significant	
	Grade 6	Significant			Significant	
Middle -Math	**Grade 8**	Significant	Significant		Significant	
	Grade 7	Significant			Significant	
	Grade 6	Significant			Significant	
Elementary - English	**Grade 5**	Significant			Significant	
	Grade 4	Significant	Significant		Significant	
	Grade 3	Significant			Significant	
Elementary - Math	**Grade 5**	Significant			Significant	
	Grade 4	Significant		Significant	Significant	
	Grade 3	Significant			Significant	

Relationships Between Principal Ratings Of Their Schools And Other Factors

The next step in the study was analysis of the responses of the facilities questionnaires returned by principals across the state. Two separate examinations were conducted. In the first, a set of basic independent analyzes were made comparing the rating a principal gave his or her school as to physical condition or adequacy to such factors as age of school, size of school, teacher and student attendance patterns, socio-economic status of the student population, and student test results. Then, an examination was made of the relationship of student test scores to various factors, taking into account the predictive value of each.

The results of the first examination are presented in this section by grade grouping (high schools, middle-grades schools, and elementary-grades schools). Presented first for each of these school groupings are the factors that were significantly related statistically to principals' ratings of the condition of their schools. Then, the factors that were examined but not found to have a relationship to physical condition are noted. A summary table at the end of this section presents a visual representation of the findings.

It should be noted that the principal's rating of the educational condition and adequacy of his or her building as reported in the following sections is a composite score. Principals were asked to indicate the impact of their school facilities individually on each of the following: Curriculum; Teachers; Students; and Parents/Community. Their choices were: Negative impact (1); No Impact (2); or Positive Impact (3). An average of their responses to the four factors was computed. This figure became the indicator of facilities condition and adequacy for each school.

High Schools

Factors Significantly Related To Principals' Ratings Of The Condition Of Schools

a. Age of Facility. The newer the facility, the better the rating of physical condition of the school.

b. Free and Reduced Lunch. The smaller the percentage of students on free and reduced lunch, the better the rating of physical condition of the school.

c. Test Performance. The higher the average SAT score for a school, the better the rating of physical condition of the school.

d. Student Attendance. The fewer days of school missed by students, the better the rating of physical condition of the school.

Factors <u>NOT</u> Related To Principals' Ratings Of The Condition of Schools

a. Teacher Attendance. Principals' ratings of the physical condition of their schools did not have a statistically significant relationship to how many days of school teachers missed.

b. Size of the school's student population. Principals' ratings of the physical condition of their schools did not have a statistically significant relationship to how many students the school housed.

Schools Serving Grades 6, 7, and 8

Factors Significantly Related To Principals' Ratings Of The Condition of Schools

a. Age of Facility. The newer the facility, the better the rating of physical condition of the school.

b. Test Performance. The greater the proportion of the student population scoring proficient or advanced in English and mathematics on PACT, the better the rating of physical condition of the school.

c. Teacher Attendance. The fewer days of school missed by teachers, the better the rating of physical condition of the school.

Factors NOT Related To Principals' Ratings Of The Condition of Schools

a. Student Attendance. Principals' ratings of the physical condition of their schools did not have a statistically significant relationship to how many days of school students missed.

b. Size of the school's student population. Principals' ratings of the physical condition of their schools did not have a statistically significant relationship to how many students the school housed.

c. Free and Reduced Lunch. Principals' ratings of physical condition of their school did not have a statistically significant relationship to the percentage of students on free and reduced lunch.

Schools Serving Grades 3, 4, and 5

Factors Significantly Related To Principals' Ratings Of The Condition of Schools

a. Age of Facility. The newer the facility, the better the rating of physical condition of the school.

b. Free and Reduced Lunch. The smaller the percentage of students on free and reduced lunch, the better the rating of physical condition of the school.

c. Test Performance. The greater the proportion of the student population scoring proficient or advanced in English and mathematics, the better the rating of physical condition of the school.

Factors <u>NOT</u> Related To Principals' Ratings Of The Condition of Schools

a. Student attendance. Principals' ratings of the physical conditions of their schools did not have a statistically significant relationship to how many days of school students missed.

b. Teacher Attendance. Principals' ratings of the physical conditions of their schools did not have a statistically significant relationship to how many days of school teachers missed.

c. Size of the school's student population. Principals' ratings of the physical conditions of their schools did not have a statistically significant relationship to how many students the school housed.

In general, how a principal viewed the physical condition of his or her school did relate significantly to several factors. What these factors were varied somewhat depending on the grades housed at a school. **However, two factors were always significantly related statistically to the principals' ratings of their schools. These were a) school age and b) test results.** The newer the facility and the higher its test results, the better a principal rated his or her school in terms of physical condition. A table summarizing the analysis is presented below:

Factors Significantly Related To A Principal's Rating Of The Physical Condition And Adequacy Of His Or Her School Facility

	SES	Building Age	School Size	Student Attendance	Teacher Attendance	Test Results
High	Significant	Significant		Significant		Significant
Middle		Significant			Significant	Significant
Elementary	Significant	Significant				Significant

However, this did not fully address the basic focus of this research study. That is, "Are test results related to such factors as physical condition of a school, as well as other factors such as age of the facility, the number of students served, teacher and student attendance patterns, and socio-economic status of the pupil population?" To get at this question, the data were again analyzed. The process and results of that analysis are contained in the following section.

Relationship Of School Outcome Measures To Principals' Ratings Of The Physical Condition Of The School, School Age, Size, Teacher Attendance, and Student Attendance

Originally, the researcher studied the relationship between school outcomes and such factors as school age, school size, and student and teacher attendance patterns. The results of this examination were presented earlier in this report. Once principals' ratings of the physical condition and adequacy of their schools could be determined from questionnaire responses, a subsequent analysis was made. Again, this examination focused on school outcomes and various factors, including principals' ratings of their buildings.

However, since not all principals returned the questionnaires, the second analysis necessarily involved fewer schools. It is important to note that the original analysis of the relationship of student outcomes to size and age of facility included approximately 930 schools. However, the subsequent comparison of student outcomes to various factors included approximately 500 schools. This reflects the number of principal questionnaires returned and available information in various data sets. The results of the analysis of the relationships among student outcomes, a principal's rating of the condition of his or her school, teacher and student attendance, and age and size of facility are presented in the following sub-sections.

High Schools:
Relationships Among SAT Scores, School Age, School Size, Teacher Attendance, Student Attendance, And Principal's Rating Of Condition Of The Facility

The SAT scores of 97 South Carolina public high schools responding to the facilities questionnaire were analyzed. The average SAT among these high schools was 938. Average daily membership among the high schools from which surveys were received was 1026 students.

The mean age of the 97 schools included in this part of the analysis was 32 years. On average 40% of the students at these schools were on free or reduced lunch.

Initial analysis among these 97 high schools indicated several significant independent relationships. Schools' average SAT scores were related to the principals' ratings of the condition of their facilities, to student attendance, teacher attendance, school size, and age of school.

Variables In Isolation Related To SAT Outcomes:
Among High Schools Returning Questionnaires

Factor	Effect
School Size	Significant
Principal's Rating	Significant
School Size	Significant
Teacher Attendance	Significant
Student Attendance	Significant

However, as was the case in the original analysis of all high schools, by far the factor most strongly related to overall SAT scores was the portion of students on free and reduced lunch (SES). Further examination revealed that, once SES of the student population of a school was taken into account, only one other factor studied had a statistically significant predictive relationship to a high school's SAT scores. That one factor was pupil attendance. The socio-economic status of the students in a school accounted for approximately 60% of the variation in SAT scores among schools. Adding the student attendance factor increased predictability to approximately 61%, a slight increase, but significant.

Proportion Of Variation In Dependent Variable (SAT Scores)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.776**	**.601**	**.597**	**46.78**
Student Attendance*	**.787**	**.619**	**.611**	**46.00**

*Includes the SES Effect

Middle Schools:
Relationships Among PACT Scores, School Age, School Size, Teacher Attendance, Student Attendance, And Principal's Rating Of Condition Of The Facility

The PACT scores of schools serving grades 6, 7, and/or 8 from which a facilities questionnaire was received were analyzed in relationship to school age and school size, teacher and student attendance, and principal's rating of the condition of the school facility. For the PACT analysis the percentages of students scoring in the proficient and advanced categories at each school in math and English was the dependent variable. There were 141 schools housing grade 6, 115 containing grade 7, and 118 with grade 8 that comprised the sample for this particular analysis. The schools from which principal questionnaires were available were on average 33 years old. The mean size of these schools serving the middle grades was about 669 students in average daily membership. Approximately 53% students in schools returning questionnaires qualified for either free or reduced lunch. In general, when the above factors were analyzed in relation to school performance in isolation a significant relationship was found for four. Teacher attendance was not significantly related to middle school performance, even when studied independently.

Variables In Isolation Related To PACT Outcomes:
Middle Schools

Factor	Effect
School Age	Significant
School Size*	Significant
Principal's Rating	Significant
Student Attendance	Significant

*In 50% of the subject analyses

English

Initial examination of the data revealed that statistically significant relationships existed between the percentage of sixth grade students scoring proficient or advanced on PACT in English and a) the age of the school, b) the attendance rate of students, c) the principal's rating of the physical condition of the facility, and d) school size when these factors were looked at independently. Interestingly, no initial relationship was found between PACT results in English at the sixth grade level and teacher attendance.

When the socio-economic level (SES) of the population of students served by the middle-grades schools was taken into account, the initial findings changed dramatically. By far, the greatest predictor of whether or not a sixth grade student would score proficient or advanced in English on PACT was his or her free/reduced lunch status. The smaller the portion of students receiving free or reduced lunch, the greater the percentage of students scoring proficient or advanced on PACT. In fact, when the effects of SES were taken into account, the only other variable that continued to have a statistically significant relationship to sixth grade English PACT

performance was student attendance. Though the relationship was small, especially compared to the impact of SES, higher student attendance rates had a significant association with greater percentages of students scoring proficient or advanced in English at the sixth grade. SES accounted for approximately 38% of the variability in test results among schools. Adding student attendance rate increased predictability to 44%.

Proportion Of Variation In Dependent Variable (Grade 6 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.619**	**.383**	**.379**	**11.4569**
Student Attendance*	**.666**	**.444**	**.436**	**10.9180**

*Includes the SES Effect

Slightly different results were found after analyzing the results of the PACT English tests for seventh and eighth graders. Individually, the factors of student attendance, age of facility, and principal rating of the physical condition of the school each were significantly correlated with the performance of seventh and eighth graders on the PACT English examination. In addition, at the seventh grade school size was a statistically significant factor in achievement when examined independently. As was the case with the sixth grade, teacher attendance was not a significant factor in predicting scores in the seventh or eighth grade. School size did not relate to student outcomes in eighth grade English when looked at independently. When the percentage of students on free or reduced lunch was factored in, SES was the largest predictor of PACT results. However, both the attendance rate of students and the principal's rating of the physical condition and adequacy of his or her school were also significant factors in predicting the percentage of

seventh and eighth graders at a school who would score proficient or advanced in English on the PACT test. In seventh grade, with SES alone, 18% of the difference among schools could be predicted. Adding student attendance patterns and the principal's rating of a school increased this considerably to 30%.

Proportion Of Variation In Dependent Variable (Grade 7 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.433**	**.187**	**.180**	**10.6110**
Student Attendance*	**.529**	**.280**	**.267**	**10.0328**
Overall Rating**	**.563**	**.317**	**.299**	**9.8127**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

In eighth grade, 17% of the variability in PACT English scores could be attributed to SES. Knowing student attendance rates and the principal's rating of his or her building raised predictability to 25%.

Proportion Of Variation In Dependent Variable (Grade 8 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.419**	**.176**	**.169**	**10.0035**
Student Attendance*	**.486**	**.236**	**.223**	**9.6703**
Overall Rating**	**.521**	**.272**	**.253**	**9.4854**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

Mathematics

The relationships of PACT mathematics results for grade 6 were slightly different from those of English. Initially, the factors of school age, school size, student attendance, and principal's rating of the condition of the school individually had significant relationships to the percentage of students scoring proficient or advanced in math on PACT at the sixth grade. As was the case with English, no initial correlation was found between PACT mathematics results and teacher attendance. When SES as measured by the percentage of students on free or reduced lunch was factored in, two elements continued to have statistically significant predictive power related to sixth grade mathematics performance. These were student attendance and the overall rating by the principal of the physical condition and adequacy of the school facility. While SES accounted for approximately 30% of the variability in math performance at six grade, adding attendance patterns and principal school rating increased predictability fo scores to 39%

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Proportion Of Variation In Dependent Variable (Grade 6 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.552**	**.304**	**.299**	**10.1882**
Student Attendance*	**.619**	**.383**	**.374**	**10.5733**
Overall Rating**	**.637**	**.406**	**.393**	**10.4114**

*Includes the SES Effect **Includes the SES Effect and Student Attendance Effect

One of the more interesting findings from the study was found in analyzing seventh grade mathematics results. Initially, the only factors analyzed individually that related to percentage of students scoring proficient or advanced in mathematics in the seventh grade were school age,

student attendance, and the rating of the physical condition of the school by the principal. Neither teacher attendance nor size of school had even an initial relationship to PACT math results at the seventh grade level. As has been reported many times so far in the report, when socio-economic status was considered, it also was found to be a predictor of PACT mathematics performance at the seventh grade. However, it was not the strongest indicator of test performance in this subject at this grade level. In fact, it was number three in power of prediction. Two other factors made greater contributions to predicting the percentage of seventh graders who would score proficient or advanced in mathematics. These were student attendance rate and the principal's rating of the physical condition of the school. Student attendance alone was associated with 15% of the variability of test scores among schools. Knowing the rating of the principal increased this predictive factor to 24%, nearly a ten point increase. The SES factor further raised predictability of seventh grade math scores to 29%, or about five points more.

Proportion Of Variation In Dependent Variable (Grade 7 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
Student Attendance	**.391**	**.153**	**.145**	**11.6103**
Overall Rating*	**.502**	**.252**	**.239**	**10.9526**
SES**	**.558**	**.312**	**.294**	**10.5545**

*Includes the Student Attendance Effect
**Includes Student Attendance Effect and Overall Rating Effect

Analysis of the eighth grade PACT mathematics results produced slightly different findings to those reported for sixth or seventh grade. The percentage of students on free and reduced lunch was the most significant predictor of the percentage of students scoring proficient or advanced in mathematics at the eighth grade. However, again two other factors significantly contributed to predicting success on the test. These were school age and student attendance. In eighth grade mathematics school SES was associated with 14% of the variability among eighth grade math test results. Adding information about school age, the second largest predictive factor, increased this to 21%. When the student attendance factor was included with SES and school age, 25% of the variability of among schools in eighth grade math performance was accounted for.

Proportion Of Variation In Dependent Variable (Grade 8 Math)
Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.385**	**.148**	**.141**	**10.6789**
School Age*	**.476**	**.226**	**.213**	**10.2222**
Student Attendance**	**.516**	**.266**	**.247**	**9.9964**

*Includes the Student Attendance Effect
**Includes Student Attendance Effect and Overall Rating Effect

Elementary Schools:
Relationships Among PACT Scores, School Age, School Size, Teacher Attendance, Student Attendance, And Principal's Rating Of condition Of The Facility

For those schools serving grades 3, 4, and/or 5 that returned the facilities questionnaire, PACT scores were again analyzed. This time the factors studied included school age, school size, teacher attendance, student attendance, and the overall rating of the physical condition of the

facility by the principal. As was the case in the first analysis, the percentage of students scoring in the proficient and advanced categories at each school in math and English was the dependent variable. There were 289 schools with grade three, 283 with grade four, and 274 with grade five that returned surveys. These schools averaged being 34 years old. The mean size of these schools was 555 students in average daily membership. Approximately 55% qualified for either free or reduced lunch. In general, when the above factors were analyzed in relation to school performance in isolation a significant relationship was found.

Variables In Isolation Related To PACT Outcomes

Factor	Effect
School Age	Significant
Teacher Attendance	Significant
School Size	Significant
Principal's Rating	Significant
Student Attendance	Significant

English

Initial examination of the data revealed that statistically significant relationships existed between the percentage of third grade students scoring proficient or advanced on PACT in English and a) the age of the school, b) the size of the school c) the attendance rate of students, d) the attendance rate of teachers, and e) the principal's rating of the physical condition of the facility, when these factors were looked at independently.

However, when the socio-economic level (SES) of the population of students served by the elementary-grades schools was taken into account, the initial findings changed dramatically. By far, the greatest predictor of whether or not a third grade student would score proficient or advanced in English on PACT continued to be his or her free/reduced lunch status. This factor alone accounted for 67% of the variability of scores among schools. In fact, when the effects of SES were taken into account, none of the other five factors contributed to predicting the success rate of third grade student on the PACT English examination.

Proportion Of Variation In Dependent Variable (Grade 3 English) Accounted For By Independent Variables

	R	**R Square**	**Adjusted R Square**	**Standard Error of the Estimate**
SES	**.820**	**.672**	**.671**	**9.754**

Very similar initial findings emerged when the fourth grade PACT English test results were initially analyzed. Individually, all five factors studied had significant relationship to success on PACT in English. However, as was the case with the third, when the effects of socio-economic status of students along with the other five factors were analyzed together, the portion of students on free and reduced lunch was the greatest predictor of the percentage of fourth grade students at a school who would score proficient or advanced on the English. What was different at the fourth grade level, though, was that one of the other five factors did continue to contribute to predicting the percentage of students who would do well in English, even after controlling for socio-economic differences. Though not nearly as strong as SES, the school age factor was a significant predictor of how students in fourth grade would do on the English exam. SES

accounted for 68.1% of the variability among schools. Knowing the age of the school increased predictability of school test scores in fourth grade English to 68.8%.

Proportion Of Variation In Dependent Variable (Grade 4 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.826**	**.683**	**.681**	**9.151**
School Age*	**.831**	**.690**	**.688**	**9.056**

*Includes the SES Effect

The analysis of fifth grade PACT English scores initially produced similar results to those of third and fourth grade in that all five factors studied independently correlated significantly with the percentage of students at a school scoring proficient or advanced in English. However, as was the case at the other two elementary grades, when the portion of students on free or reduced lunch was included in the analysis, it again was by far the largest factor in predicting how students would perform. What made the fifth grade English findings different was that one of the two other factors that continued to make a statistically significant contribution to predicting success was teacher attendance. SES accounted for 66% of the variability among the scores of fifth graders in mathematics. Knowing the student attendance rate at a school raised this predictability factor to 66.7%. When the effect of teacher attendance was added to the effects of SES and student attendance, 67.3% of the variation in fifth grade English scores was accounted for.

Proportion Of Variation In Dependent Variable (Grade 5 English) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.813**	**.661**	**.660**	**8.691**
Student Attendance*	**.818**	**.670**	**.667**	**8.601**
Teacher Attendance**	**.823**	**.677**	**.673**	**8.523**

*Includes the SES Effect
**Includes SES Effect and Student Attendance Effect

Mathematics

Initial examination of the data revealed that statistically significant relationships existed between the percentage of third grade students scoring proficient or advanced on PACT in Math and a) the age of the school, b) the size of the school c) the attendance rate of students, d) the attendance rate of teachers, and e) the principal's rating of the physical condition of the facility, when these factors were looked at independently. This mirrored the English findings as noted above.

And, as has been the case throughout, when the socio-economic level (SES) of the population of students served by the elementary-grades schools was taken into account, the initial findings changed dramatically. By far, the greatest predictor of whether or not a third grade student would score proficient or advanced in mathematics on PACT was his or her free/reduced lunch status. It alone accounted for 60.5% of the difference in scores among schools. However, a second factor did significantly contribute statistically to predicting mathematics success. That factor was student attendance. Knowing the attendance rate of students increased predictability of grade three math scores to 61.8%.

Proportion Of Variation In Dependent Variable (Grade 3 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.779**	**.607**	**.605**	**10.369**
Student Attendance*	**.788**	**.620**	**.618**	**10.205**

The findings for grade four were slightly different. Again, all five factors individually related significantly to performance on the PACT fourth grade mathematics test. When the free and reduced lunch factor was considered, two other factors continued to relate significantly to predicting performance. Student attendance again was a factor, but so too was school size, with larger size being associated with better results. SES was related to 53% of the variability among fourth grade math scores. The student attendance factor raised this to 53.8%, and knowing school size increased predictability yet again to 54.4%.

Proportion Of Variation In Dependent Variable (Grade 4 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.730**	**.533**	**.531**	**10.643**
Student Attendance*	**.736**	**.541**	**.538**	**10.571**
ADM**	**.741**	**.549**	**.544**	**10.496**

*Includes the SES Effect
**Includes SES Effect and Student Attendance effect

At grade five in math, the results of the analysis were similar to grade 3. School age, size, principal's rating of the condition of the school, teacher attendance, and student attendance individually and independently correlated to the percentage students who could be expected to score proficient or advanced in mathematics. Again, the largest predictor of success was the socio-economic status of the school's student population, accounting for 53% of the variability among school scores. However, student attendance rates continued to make a statistically significant contribution to predicting success on the PACT mathematics examination at grades five increasing the predictability factor to 55%..

Proportion Of Variation In Dependent Variable (Grade 5 Math) Accounted For By Independent Variables

	R	R Square	Adjusted R Square	Standard Error of the Estimate
SES	**.729**	**.532**	**.530**	**10.269**
Student Attendance*	**.743**	**.553**	**.549**	**10.060**

*Includes the SES Effect

Summary

In general, for the more than 500 schools that returned questionnaires, initial findings were similar to the first analysis. Factors such as age of school, school size, and attendance patterns were related independently and separately to PACT and SAT scores. And, knowing the rating principals gave their schools as to physical condition and adequacy also was independently significantly related to how a school on average performed on tests. However, the major factor in predicting test scores continued to be percentage of students on free and reduced lunch. This component was so very strong that the effects of other variables, even when statistically

significant, were often relatively minor in comparison. Nonetheless, some other factors did help predict how students in various schools would score on the SAT or PACT.

At the high school level knowing student attendance rates proved to be statistically significant in predicting SAT scores. The effect was noted even after controlling for SES.

At schools housing the middle-grades, other than SES, the one factor that was always associated at a statistically significant level with PACT results was student attendance. This was true at all three grade levels, for both math and English - the fewer days a middle school student missed school, the better they scored on both the English and math PACT examinations. Two other factors did manifest themselves in specific instances. At the eighth grade level the age of the school facility was associated at a statistically significant level with predicting success on the PACT math results for eighth graders - the newer the facility, the more students scoring proficient or advanced. At the sixth and seventh grade levels, the principal's rating of the physical condition of the school contributed at a statistically significant level to predicting seventh grade math performance. Similarly, knowing the principal's rating of the facility was significantly associated with seventh and eighth grade English scores. In two of three middle school grades, this meant that, in both English and math, the better the condition and adequacy rating of the building, the more students scoring proficient or advanced. What is particularly interesting to note was that for seventh grade math, SES was the third ranked predictor of scores. School attendance and principal's rating of his/her facility were greater predictors of how students would perform in seventh grade math than knowing the percentage of students on free or reduced lunch.

At schools housing the elementary grades, other than SES, the one factor that regularly correlated at a statistically significant level with PACT success was again student attendance. However, it was a factor consistently only for math, not English performance. Two other factors

did emerge in specific instances as significantly related to test performance. These were age of school for fourth grade English results and size of school (larger being better) for fourth grade mathematics performance.

Overall, as was the case in the state-side analysis presented earlier, most physical factors when studied independently in this more limited sample did regularly correlate highly with school outcome measures, including principals' ratings of the condition and adequacy of their school facilities. However, as was found with the original sample, when the percentage of students on free and reduced lunch was considered in the analysis, it again often "washed out" the effects of other factors in many cases.

Factors That Were Found To Be Significant In Predicting Test Results When Factoring In The Effect of Percentage Of Students On Free or Reduced Lunch: Surveyed Sample

		SES	Age	School Size	Student Attendance	Teacher Attendance	Principal Rating
High	SAT	Significant			Significant		
Middle - English	Grade 8	Significant			Significant		Significant
	Grade 7	Significant			Significant		Significant
	Grade 6	Significant			Significant		
Middle -Math	Grade 8	Significant	Significant		Significant		
	Grade 7	Significant			Significant		Significant
	Grade 6	Significant			Significant		Significant
Elementary -English	Grade 5	Significant			Significant	Significant	
	Grade 4	Significant	Significant				
	Grade 3	Significant					
Elementary - Math	Grade 5	Significant			Significant		
	Grade 4	Significant		Significant	Significant		
	Grade 3	Significant			Significant		

Principals Speak To The Issue Of The Relationship Of School Facilities To School Outcomes

Principals were asked to provide written comments about school facilities-related issues when they returned the questionnaires furnished to them by the researcher. Three groups of principals were also invited to three focus group sessions to interact with the research on facilities-related issues. This section of the report describes and presents the written and oral comments made by South Carolina principals participating in this study.

Principals Speak

Feelings about the effect of school facilities often fell within two categories as epitomized by the following two comments:

> **Our school facilities work against our instructional program in many ways. Having a diverse age population is difficult and even dangerous at times. Having portables means that we don't always have our grade levels together. This makes grade level and cross-grade level planning very difficult. Also, we do not have a science lab of any kind. How can we compete instructionally with our well-equipped neighbors?**

> **New facilities definitely have a positive impact on teaching and learning. We came from a small school that had ten mobile units (to our new school). School facilities <u>do</u> make a difference!**

Approximately 565 principals returned questionnaires. The written comments they provided about facilities issues and factors were summarized and then placed into categories. The most often made comments emphasized that good facilities motivate students, instill pride in them, and improve their behavior (212 responses). Almost as frequent were the comments that good facilities provide a positive and attractive environment which helps attract and retain faculty

(204 responses). A substantial number of comments (142 responses) also indicated that good, attractive facilities increased parent and community involvement.

In face-to-face meetings with the researcher elementary, middle, and high school principals reiterated these statements. Most felt that the primary factor school facilities affect is attitudes. As several commented, attractive, functional facilities make students, teachers, parents, and even the general community feel positively toward the school. When there is a positive attitude across all of these groups, school programs benefit.

This theme ran throughout the meetings and was embedded in many of the written comments. One principal summarized the feelings of a number of his colleagues on this topic when he stated:

> **New buildings cause new attitudes to come about and new attitudes lead to change.**

On the other hand, poor facilities can bring about negative attitudes, which limit the productivity of the school. As another principal commented:

> **Our worn out facilities are becoming impossible to keep clean. It sends the message that third-rate is acceptable.**

Not only is attitude a concern, poor facilities may affect schools negatively across multiple dimensions. As a principal lamented:

> **It is very hard to attract and retain good teachers at a school that is 14 miles from any town and that is old, rundown, and 46 years old. The school is also spread out and many of the teachers do not feel safe because we have no system in place for them to contact the office if something should occur that is dangerous to them or students.**

The issue alluded to in the above quote, the relationship of school safety to facilities, was raised several times. In written statements and in comments made in face-to-face meetings with the researcher, principals worried that old schools were not designed to protect the health and safety of students or staff. One principal expressed it this way:

> **Our hallways are extremely crowded. Students have difficulty moving through them, especially when others are using lockers. This crowded situation presents safety issues - students getting angry when bumped or pushed and losing tempers.**

A second principal adds an another dimension to the relation of facilities to safety when he states:

> **It is impossible to ensure students' safety from intruders (in my school) due to the ease of access to the building.**

This is not to say that principals thought the facility was the most important thing in assuring a good and safe school. Many felt similarly to the principal who said when asked to comment on the role the facility plays in providing quality education:

> **I do not feel that the age of a building dramatically reduces a child's chance of success; however, new facilities afford children wider opportunities and let them know that education is value by their community and state.**

Another reinforced this, stating:

> **Good schools teach students well regardless of the condition of the facility. However, well-maintained, attractive, and secure schools reduce classroom disruptions while establishing positive student and staff attitudes.**

Though principals considered school facilities to be only one aspect of providing a good school, many did comment that poor facilities were having a direct bearing on their ability to prove instructional programs. A principal complained:

Old facilities (at my school) requiring upgrades, such as science labs, prevent students from receiving adequate, appropriate instruction parallel to that available in other schools with this same district.

Another, making a similar point stated that:

Students in portables (at my school) get frustrated when they cannot access the network on their computers. This causes inequity of technology opportunities for them.

Adding a slightly different perspective on how poor facilities were negatively impacting instruction at her school, a principal provided this remark:

Lack of classroom space for small group instruction has hindered (our) effectiveness with reading instruction. Several teachers have to share classroom space. Most of the students requiring individual or small group instruction are easily distracted. Having two faculty teaching at the same time (in the same space) is often distracting.

Summary

Principals reinforced their responses on the facilities survey through their oral and written comments. They felt that the condition and adequacy of school structures do make a difference in what happens at school. They indicated that the relationship is complex. Facilities affect attitudes, attitudes affect how students learn and how teachers instruct. The extent to which teachers and students are positively and completely focused on the educational process affects school outcomes, including test scores. It is through this intricate relationship, many principals believe, that facilities are one critical element in optimizing learning. As one principal somewhat sarcastically put it when asked if the physical environment was related to what goes on in schools:

This is a "duh" question. If you had the choice to teach in a new, clean, modern school, or in one that is 25-40 years old, especially in a portable, what would you do?

Or, as another principal who equated facilities to the human body phrased it:

The bottom line is that school facilities need to be inviting, projecting a positive image, and above all, meet the needs of all students. (After all), buildings are like principals, they wear out.

Summary, Discussion, and Conclusions

In the following paragraphs are presented a summary of the findings of this research study, discussion of the findings, and conclusions reached by the researcher based on available data. The summary is subdivided in finding from the various data sources used in this study A reference section is provided at end.

Summary

The literature review revealed that a number of studies have been conducted on the relationship of school outcomes to physical factors related to school buildings and their environments. These studies have found that a) the condition of a school can affect student academic outcomes, b) school size and location can impact on educational productivity, c) size and the physical environment of spaces are related to student productivity and well-being, d) the size of student groupings (teacher/pupil ratios), which affect and are affected by space, impact on student achievement, and e) different grade-level configurations are associated with higher or lower levels of pupil performance.

The present study sought to determine if the findings in literature were valid for public schools in South Carolina. Several sources of data were used to analyze the relationship of school facilities to student outcomes. These included data collection through questionnaires, analysis of state data bases, and meetings with school principals. From these sources, the researcher has developed a listing of findings.

What Was Learned From Principal Questionnaires

A. Most principals, regardless of grade level, strongly felt that good school facilities are related to student achievement.

B. The program most often identified by principals as being affected by the condition and availability of facilities was science.

C. The one school factor identified by almost all principals as being affected by the condition and adequacy of a school facility was teacher attitudes.

D. In addition, at least three out of every four principals indicated that the adequacy of the school facility impacted teacher recruitment and retention, student behavior, and parent and community attitudes and support.

E. A majority of principals in this state considered their own facilities to be adequate to support their instructional programs.

F. However, one in five principals (20%) believed that his/her facility is having a negative effect on delivery of the educational program in his or her school.

G. Areas most often cited as negatively affecting school outcomes were building condition and adequacy, storage, portables, overcrowding, size, and building layout.

H. The physical factor most often considered to be adequate by principals was the technology system in the school.

I. A majority of principals believed that their current grade level configuration and teacher-pupil ratio were making a positive contribution to student outcomes.

What Was Learned From Analysis Of Test Scores In Relation To School Age, School Size, And Student and Teacher Attendance Patterns

A. School age, school size, student attendance, and teacher attendance, when studied in isolation, were almost always related to student performance.

B. However, the overriding ingredient in predicting school performance was found to be the percentage of students on free and reduced lunch.

C. In spite of the large effect of SES, other factors did periodically emerge as predictors of success at certain grade levels and subject areas studied.

D. Student attendance was the factor studied that most often was associated in terms of statistical significance with student outcomes after controlling for SES. However, the factors of school age and school size, even after considering the impact of the percentage of students on free and reduced lunch, periodically emerged as predictors of school performance.

E. In general, results appeared to indicate that students tended to perform better on tests who were not poor, who went to newer schools, who attended class more often, and whose schools were larger in student population.

What Was Learned From A Comparison Of Principal's Ratings Of The Physical Condition And Adequacy Of Their Schools To Other Factors Studied

A. Principals in newer buildings rated the physical condition of their schools more positively, regardless of grade grouping.

B. Principals in schools with better test scores rated the physical condition of their schools more positively, regardless of grade grouping.

C. Size of school was not significantly related to how a principal rated the physical condition and adequacy of his or her school.

D. Depending on the grade level, other factors associate with a principal's rating of his or her school were teacher attendance, student attendance, and percentage of students on free and reduced lunch.

What Was Learned From Studying The Relationship Between School Academic Outcomes Among The Schools Returning The Facilities Questionnaires

A. As was the case with the larger sample, the greatest predictor of school academic success was the percentage of students on free and reduced lunch (SES).

B. However, as was the case with the larger sample, the factors of school age, school size, student attendance, teacher attendance, and principal's rating of the condition and adequacy of his or her school each independently had a significant relationship to outcomes. When controlling for differences in SES, the impact of some or all of the studied variables was erased, depending on the test, subject, and/or grades analyzed.

C. Even when the large impact of poverty was controlled for, the factor that almost always was a predictor of student test performance was student attendance.

D. When controlling for the impact of poverty, the factor that emerged as a predictor of school test performance, after student attendance, was the principal's rating of the physical condition and adequacy of his or her school.

E. Other factors that did periodically emerge as predictors of school test performance, despite the large effect of SES, were school age, school size, and teacher attendance.

F. In general, students in this smaller sample tended to perform better on tests who were not poor, who attended newer schools, who missed fewer classes, whose teachers missed fewer days, whose schools were larger, and whose principals' rated their school facilities as physically adequate.

What Was Learned From Principal Written And Oral Comments About The Relationship Of School Academic Outcomes To Facilities Related Factors

A. Principal comments indicated that the issue of the relationship of school facilities to school outcomes is extremely complex. So many factors come into play in operating a school that it is difficult if not impossible to define the extent to which any one factor contributes to a student's success or failure.

B. Principals often spoke of the importance of the condition and adequacy of school facilities to teacher attitudes, teacher recruitment, and even teacher retention. Because teachers are in high demand today, they have more job opportunities. Districts and schools that can offer better working conditions are attracting and keeping better teachers.

C. Many principals talked about the impact of the physical appearance of the school on both parents and the general community. Several related stories of parents who were initially reluctant to enroll their children in a school because of the way it looked, even though the school had a good academic reputation. Some also talked about how members of their communities expressed positive or negative opinions of the school based on its outside appearance, without ever coming into the building.

D. Principals often commented on the relationship of the condition of a school and the amount of "energy" and "time" they could devote to instructional leadership. They stated that if the physical conditions of the facility are poor, the principal often must spend inordinate amounts of time trying to correct or overcome these problems. The more a principal must focus on problems of facilities, the less time he or she can devote to the instructional program, interacting with teachers, and being in classrooms.

E. Health and safety are critical concerns of many principals today. Especially in older schools principals worry about alarms that don't work, too many exterior doors to try to supervise who comes and goes, building designs that make monitoring of halls nearly impossible and create "nooks and crannies" in which inappropriate or illegal activity can occur, and school sites that are too small or poorly designed that endanger students during arrival and dismal times.

Synopsis

Most building administrators believed that the condition and adequacy of school facilities have a direct connection with how well students perform academically. However, they considered the relationship to be complex, and not easily quantified. The large majority thought that facilities affect teachers, who then affect learning.

When facilities factors are looked at individually, almost all of them have a statistically significant relationship to school outcome measures. This supports the perspective of the principals of this state.

However, when the percentage of students on free and reduced lunch is included as a control variable in analyzing the effects of facilities on student achievement, it is so closely related to

how students perform in South Carolina schools that other interactions often become negligible to non-existent in comparison.

Based on the findings of this study, facilities factors can, and in many cases do, make a difference in how students perform academically in school. However, the effects of socio-economic status, social class if you will, are so great and so intertwined with other variables that distinguishing the impact of facilities factors from a strictly statistical perspective is challenging. As noted earlier in this report, the evidence from this study suggests that children who do poorer in school come from older, smaller schools, that are rated by their principals as less adequate, and in poorer physical condition. But, these schools are also the ones most likely to be serving large numbers of students in poverty. Because of this, it is very difficult to isolate the statistical effects of school facilities variables.

However, when a more holistic review of data is made, a strong case emerges that school facilities conditions make a "real life" difference in what happens in schools. For example, when principals' ratings of their facilities were compared to the age of their buildings, an obvious patten emerged. Principals in newer schools rated their buildings better. By itself, this is not very revealing. However, the principals who rated their facilities better also were in schools that had higher test score performance. Logic then leads to the conclusion that newer schools, which typically have more adequate facilities, are related to better student performance.

Further, being in school is important. Even after controlling for SES, student attendance often was significantly related to test performance. Except for the middle school level, teacher attendance was related to school performance, though the effect dissipated when SES was considered. It seems logical to assume that students and teachers are more likely to attend school if the environment is pleasing, is conducive to learning, and provides a feeling of safety. If this is

the case, and performance is related to attendance, then better performance again becomes the product of school programs located in better facilities.

Said differently, from a holistic perspective, this study confirmed previous research. School facilities make a difference in educational outcomes, even when complexity of the effect of poverty is considered.

Discussion And Conclusions

As with other research, this study did find that differences in school performance across schools was heavily related to poverty. Based on the results, some may want to conclude that, since poverty accounts for so much difference among schools, facilities are not important. That conclusion would be incorrect. Poverty and facilities factors are complexly intertwined. The poverty of a community often is the cause of the poor condition of the school facilities in that community. However, old, inadequate school facilities inhibit learning and teaching. Without success in learning and teaching, communities and their children in all likelihood remain in poverty.

Conclusion One: One critical link in breaking the inter-relationship of poverty and poor academic performance is to provide school facilities for all students, regardless of the economic wherewithal of their community, that support teaching and learning.

Principals, students, and teachers spend an inordinate amount of time and energy overcoming the physical environments of schools. Instead of observing instruction in a classroom, principals often find themselves spending a large portion of the school day trying to get a leaky roof fixed, or a cooling system back up and running. Teachers struggle to find needed

instructional items among materials tacked high on his/her desk because of lack of storage. They lose valuable class time trying to reset electrical outlets tripped by too many computers operating at the same time. Students tire and lose concentration as classroom temperatures climb because of inadequate air conditioning. They also lose their tempers as they are forced to travel crowded hallways. The list goes on and on, but the point is the same. Physical environments of many schools keep principals, teachers, and students from devoting their full attention to the learning process.

Conclusion Two: South Carolina will not optimize test results (student outcomes) so long as the physical environment in schools continues to take away value time and energy from the educational process.

The South Carolina public schools studied, which was most of them, were on average approximately 35 years old. Assuming that schools last approximately 50 years, the typical school in this state is 70% used up. They often have undersized classrooms, very little support such as storage, are hard to heat and cool, difficult to supervise, etc. Many do not have properly designed spaces for complex instructional programs such as science. In general the average South Carolina school gives a dated, care-worn appearance to the general public.

In the private sector, where businesses recognize the importance of first impression, facilities are regularly updated and replaced. Whether it be Wal-Mart, Lowes, or Nations Bank, it is hard in many communities to find a commercial facility that is more than ten years old, though the corporations themselves have been around for decades. Why? These industry leaders know that attractive facilities tell the customer that the business inside is vibrant, first-rate, and committed to quality.

Conclusion Three: If South Carolina schools are to be first rate, the state must take a lesson from the private sector and provide facilities that say, "Quality can be found inside." In many cases this will require replacement of existing schools with new facilities. In others, major renovation and remodeling will be necessary.

In many communities across South Carolina, raising sufficient funds to provide needed facilities is nearly impossible because of low tax bases, etc. Students often are penalized in terms of inadequacy of school facilities they must attend for no other reason than where they happened to be born. Though the state has periodically attempted to rectify this by instituting facilities construction funding systems, to date none has been particularly successful. Approaches to date have been plagued with inadequacy of funds, and/or instability of revenue.

Conclusion Four: Based on the findings of this study, particularly in the context of research literature in this field and the input of principals, the state of South Carolina needs to make a concerted effort to a) determine the cost of upgrading school facilities across the state so they support instructional programs, b) identify a stable and adequate funding source to pay for school facilities construction and improvements, c) develop and implement a funding formula that distributes these funds so that, regardless of local ability to pay, the magnitude of school's facilities needs is the critical factor in level of funding, and d) move forward as rapidly as possible with providing adequate facilities for all students.

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VII. Electronic Resources

www.aaie.org – Association for the Advancement of International Education

www.aasa-tqn.org/index.html-ssi – American Association of School Administration

www.appa.org – Higher Education Facilities Officers (APPA)

www.asbj.com – American School Board Journal

www.asumag.com – American School and University Magazine

www.cefpi.com – Council of Educational Facility Planners

www.coe.uga.edu/sdpl/sdpl.html – School Design and Planning Laboratory

www.designshare.com – Design share

www.designshare.com/UEF.htm – Urban Educational Facilities

www.edfacilities.org – national clearinghouse on Educational Facilities

www.edi.msstate.edu – Educational Design Institute

www.fefpa.org –Florida Educational Facilities Planners Association

www.newvisions.org – new Visions for Public Schools

www.schoolclearinghouse.org – North Carolina School Design Clearinghouse

www.schoolconstructionnews.com/pages/other.html –School Construction News

www.scup.org/nexus1.htm – School Planning

www.smmag.com – School Planning Management

www.spmmag.com – School Planning and Management Magazine