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Does High School Size Matter for Rural Schools and Students?

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Does High School Size Matter for Rural Schools and Students?

For many years, researchers and educators across the country have debated over the issue of secondary school size and its effect on students. Proponents of small schools argue that there are substantial advantages to small schools, such as low drop out rates and closer interpersonal relations among students, teachers and administrators. In a review of over 100 research studies on school size, Cotton (1996) identified 18 major points that support small schools over large schools. She found that academic achievement in small schools was at least equal- and often superior- to that of large schools. She also found that student attitudes toward school in general and toward particular school subjects as well as teacher attitudes toward their work and their administrators were more positive in small schools than in large schools. Additionally, she reported that poor students and those of ethnic minorities were more adversely affected, academically and behaviorally, by attending large schools than were other students.

Opponents of small schools, however, tend to focus on the cost and curricular benefits of larger schools. A great deal of school consolidation has been based on the beliefs that larger schools are less expensive to operate and have higher-quality curricula than small schools. Research has demonstrated, however, that neither of these assertions is necessarily true. When comparing curriculum offerings of small and large schools, Lee, Smerdon, Alfred-Liro, & Brown (2000) reported that larger schools did in fact offer more courses than the smaller schools in their study. However, they found that the curriculum structure in the larger schools was set up to mainly serve students at the extremes of the ability distribution. Smaller schools, on the other hand, had curriculum

offerings that were targeted toward the middle of the ability distribution and had options in place to support those students at the high or low end of the distribution (e.g. be able to go out to local colleges to take certain courses not available at the school). Although the large public high schools offered something for everyone, it appeared that only the most able students (and their parents) had sufficient knowledge to choose wisely from the wide array of courses.

The argument over school size has yielded extensive research and investigation, but few clear answers. This is particularly true for rural schools. What is the best high school size for rural students? There is no clear agreement among researchers and educators when it comes to defining an optimal school size, although some have indicated what they consider to be an appropriate and effective school size. However, many of these studies include urban sites, sites not applicable to rural states. In addition, what may be considered “small” in one state many times is too large for a rural state, with many very small schools in geographically isolated areas. Thus, additional research is warranted on high school size in rural states.

The purpose of this study was to examine the effects of varying school sizes in one rural Northeastern state in a manner never done before. Moreover, this study was designed to address five research questions: (a) Do costs vary in different size schools? (b) Does student performance vary in different size schools? (c) Do educational programs vary in different size schools? (d) Does school culture vary in different size schools? (e) Do student attitudes vary in different size schools?

Methodology

Sample

There are a total of 202 secondary schools in Maine from which the sample was derived. From this number, all private schools were eliminated (except private schools with 60% or more publicly-funded students), all schools without grades 9 through 12, and all specialized schools (those schools coded as vocational or alternative). This left a sample size of 102 four-year public high schools. The smallest school has 120 students and the largest school has a little over 1,300 students.

School-size Categories

Several approaches were taken in developing the six school size categories that were used in the study. First, the researcher reviewed other empirical studies in school size in order to get a sense of what has been done in the past. Although numerous combinations of school size categories have been used in other studies, each study appeared to develop their own categories, taking into consideration the characteristics of the state in which the study took place and the particular goals of the study.

Second, the researcher examined the clusters of configurations of Maine's high schools and looked at the standard deviations of these naturally occurring clusters of schools. These approaches provided useful information that allowed the researcher to make an informed judgment as to which school size categories to develop that were relevant to Maine. It was determined that if too few school size categories were used, there would be too much variance within each category and possible effects could get lost. As a result of the analysis, six school size categories were developed and used in the study (see Table 1).

Table 1
School Size Categories of Maine's Rural Public High Schools (N= 102)

School Size Category	<u>n</u>
< 300	14
300-450	27
450-600	17
600-750	18
750-1000	14
> 1000	12

Data Sources

Data from three key sources were used to answer the research questions. One source was demographic and financial data collected yearly by the Maine Department of Education. A second source was the 1999 Maine Public School Census Survey, a survey designed by the Maine Education Policy Research Institute (MEPRI) and given out to all the state's public school principals. Approximately 70% of Maine schools responded to the survey. The survey collected information about curriculum and instructional practices, school resources, and student activity participation rates.

The third data source was the 1999-2000 Students Speak Survey. This survey was developed by the National Center for Student Aspirations (NCSA) as a tool to measure student aspirations and student perceptions of school climate conditions that influence student aspirations (Plucker & Quaglia, 1998). The participating high schools administered the survey to their students and returned completed surveys to NCSA. The NCSA collected data for over 20,000 high school students, representing 57 Maine high schools. The mean age of the adolescents was 16.3 years. Thirty percent (n=6008) of the students were freshman, 28% (n=5644) were sophomore, 23% (n=4560) were junior, and

18% (n=3696) were senior. Ninety percent of the students were White, 2% were American-Indian, 1% were Asian, 0.6% were Black, 3% were Franco-American, 1.3% were Hispanic, and 0.6% were Native Hawaiian or other Pacific.

Data analysis of the three data sources included both inferential and descriptive statistics. An alpha level of .05 was used for all statistical tests.

Limitations of the Study

This study had several limitations. First, because this was an ex post facto study, the researcher had to work with the data that was available, thus, assurance of the quality of the data is not possible. Additionally, data on all variables examined in the study were not available for all schools and in all cases. Third, because of the ex post facto nature of the study, the researcher had to in many cases use operational definitions of variables developed by other researchers. Therefore, some caution is warranted when drawing conclusions from the data.

Results

Do Costs Vary in Different Size Schools?

Per pupil operating cost expenditures (PPOCE) were used as the measure for determining cost differences among the varying school size categories. PPOCE was selected because it excludes transportation, vocation education, special education, and debt service, and thus, more closely reflects the cost of providing the core general education program in schools.

Table 2 reports mean PPOCE according to school size category. As the means indicate, there is a general trend that shows that as school size decreases, per pupil

operating cost expenditures increase. An analysis of variance (ANOVA) revealed that there were significant differences in PPOCE between school size categories < 300 and 750-1000 (see Tables 2 and 3). Therefore, in response to the research question, it was found that generally, costs do vary among different size schools. The smallest high schools in Maine are more costly to operate than larger high schools.

Table 2
Mean Per Pupil Operating Cost Expenditures of Varying School Size Categories

School Size Category	<u>M</u>	<u>SD</u>
< 300	6171.80	1158.85
300-450	5713.39	1245.65
450-600	5343.96	1098.84
600-750	5259.00	625.70
750-1000	4814.14	611.46
> 1000	5175.70	634.46

Table 3
One-Way Analysis of Variance Summary for Per Pupil Operating Cost Expenditures

Source	<u>Df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Between groups	5	24580356.80	4916071.360	4.7956**
Within group	107	109688695.40	1025127.995	
Total	112	134269052.20		

**p < .0005

Although most studies on school size find that smaller schools are more expensive to operate than larger schools, many researchers argue that the additional costs of supporting smaller schools needs to be weighed against their more positive educational outcomes (such as high school completion and postsecondary enrollment rates).

Does Student Performance Vary in Different Size Schools?

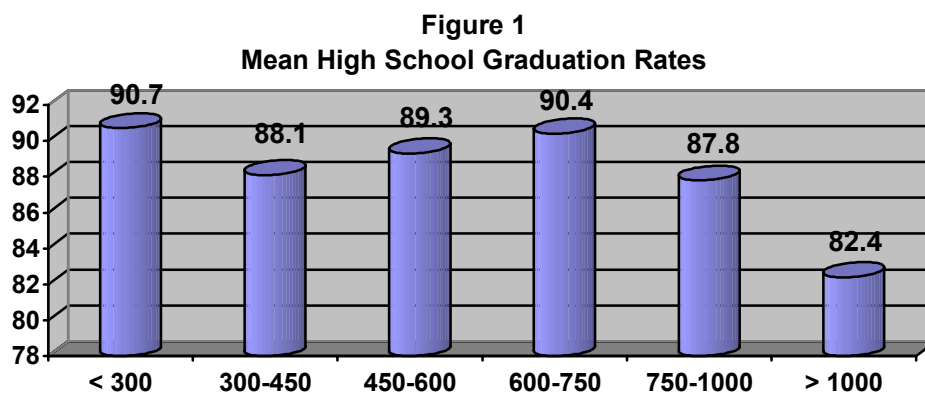
Three measures of student achievement were used to determine whether there were differences among the varying school sizes. The first was Maine Educational Assessment (MEA) data. The MEA is the statewide standardized test that measures student performance in seven content areas: reading, writing, mathematics, science, social studies, visual and performing arts, and health. The MEA is administered to all fourth, eighth, and eleventh graders in Maine. In the MEA, students are identified as meeting certain levels of achievement (performance levels) that correspond with learning standards in the Maine Learning Results (statewide standards for learning). The performance levels and score ranges are described as follows: (1) Exceeds the standards (561-580); (2) Meets the standards (541-560); (3) Partially meets the standards (521-540); and (4) Does not meet the standards (501-520). The second and third measures of student achievement were high school graduation rates and intent to enroll in a postsecondary institution rates.

MEA data for school years 1998-1999 and 1999-2000 were obtained for all high schools in the study. The two years were averaged and analyzed. As Table 4 indicates, all mean scale scores for the school size categories were in the “*partially meets the standards*” performance level. An ANOVA revealed that there were no significant differences among the school size categories in any of the seven content areas (see Table 4). This indicates that there is no relationship between school size and student achievement as measured by the MEA.

Table 4
Mean Scale Scores (2-year average) of the Maine Educational Assessment

<u>Content Area</u>	< 300	300-450	450-600	600-750	750-1000	> 1000
Reading	537	540	540	540	539	540
Writing	532	535	535	535	534	535
Math	523	526	527	528	526	526
Science	524	527	527	527	526	526
Social Studies	525	529	528	530	527	529
Visual and Performing Arts	527	528	529	529	527	528
Health	538	539	539	539	539	538

High school graduation rates and intent to enroll in a postsecondary institution rates were obtained for all the schools in the study. An ANOVA of high school graduation rates revealed that there were significant differences between school size categories < 300 and 600-750, and school size category > 1000. As Figure 1 illustrates, the means ranged from 82.4% to 90.7%, indicating that there is a general pattern when looking at high school graduation rates and school size; high school graduation rates tend to increase as school size decreases.



Data of students' intent to enroll in a postsecondary institution was obtained for school years 1997-1998 and 1998-1999. An ANOVA of the two-year average of intent to enroll in a postsecondary institution revealed that there were no significant differences

between the school size categories (means ranged from 59.2% to 68.1%), indicating that a students' desire to go on to postsecondary education is not related to their high school size. In an investigation of projected educational attainment of Maine's ninth grade students, the Center for Educational Policy, Applied Research and Evaluation at the University of Southern Maine, found that 65.5% of ninth grade students planned to attend college or university. However, approximately 52.4% of those students actually enroll in a college or university, indicating that students' intent to enroll is generally higher than their actual enrollment. Unfortunately, actual enrollment data is not available by high school. This information may be important to determining if actual enrollments vary by school size.

In response to the research question, does student performance vary in different size schools, the answer is yes and no. The answer is yes for some school sizes when student performance is measured by high school graduation rates, a finding that is consistent with most findings from studies on high school size. However, when looking at students achievement in terms of performance on the MEA, the state standardized test, student achievement did not appear to vary in different size schools. Additionally, there were also no differences among the schools in students' plans to enroll in a postsecondary institution.

Do Educational Programs Vary in Different Size Schools?

Four measures were considered when looking at educational programs in different size schools: curriculum, extra-curricular activities, teacher educational attainment, and teacher-student ratios.

Curriculum. Curriculum offerings in the areas of math and science were examined in this study. While investigating the types of courses offered at the schools, two specific areas were looked at: percent of students that would have completed the course by graduation and percent of schools that offered a core curriculum and Advanced Program (AP) courses. No significant patterns emerged in either area. When looking at percent of students that would have completed math courses by graduation, there was substantial variation among the school sizes. The same was the case for science courses.

Table 5 reports the percent of schools that offered a core curriculum and AP courses in the areas of math and science. As the table reveals, a higher percentage of larger schools were offering students math and science AP courses than were smaller schools. However, only a small percent (5-7%) of students had taken AP Calculus by graduation. More students had completed AP science courses (2-18%) by graduation. Nevertheless, these numbers indicate that only a small minority of students were benefiting from the advanced curriculum. When looking at the percent of schools that offered a core curriculum, again there was substantial variation among the school sizes, with no real patterns identified.

Table 5
Percent of Schools that Offer a Core Curriculum and AP Courses

Curriculum	< 300	300-450	450-600	600-750	750-1000	> 1000
Math ¹	83	72	100	67	75	50
AP Calculus	42	61	43	67	75	75
Science ²	64	50	57	33	63	25
AP Science Courses ³	8	6	14	20	13	25

¹ Core Math curriculum includes: Algebra I, Algebra II, Geometry, Pre-Calculus, and Calculus.

² Core Science curriculum includes: Physical science, Earth science, Chemistry, and Physics.

³ AP Science courses include: Biology, Chemistry, and Physics.

Haller, Monk, Bear, Griffith, & Moss (1990) reported similar findings when they investigated school size and program comprehensiveness. They defined “program comprehensiveness” as curriculum programs that offered base courses, advanced courses, and alternative courses in a given subject. In a review of 481 high schools, they found that although the larger schools in their study offered more comprehensive programs than the smaller schools, there was substantial variation in comprehensiveness among math, science, and foreign language at any given school size.

In addition to curriculum offerings, the percent of course failures and time per week spent on homework were also investigated. In the Census survey, principals were asked to indicate what percent of students in their school had failed one or more courses in each grade (9-12). An ANOVA of the four-year average revealed there were no significant differences between the mean percent of course failures among the different school sizes, although the range was from 14% (in the < 300 category) to 27% (in the 750-1000 category).

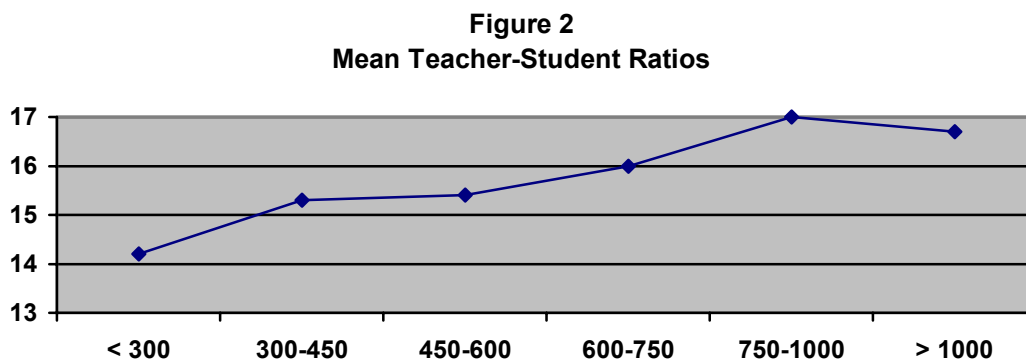
When looking at how much time per week students spent on homework, an ANOVA revealed that students that attended the 300-450, 450-600, and > 1000 size categories reported spending significantly more time on homework than students in the < 300, 600-750, and 750-1000 school size categories. It is difficult to determine why these differences occurred and they may reflect problems with the quality of the data.

Extra-Curricular Activities. Students that attended the 450-600, 600-750, and > 1000 size categories reported spending significantly more time on sports and hobbies than students in the < 300, 300-450, and 750-1000 size categories. This suggests that students

in the medium to large schools are spending more time on sports and hobbies than students in the smaller schools.

Teacher Educational Attainment. There were no significant differences in the mean percent of staff holding advanced degrees among the different school size categories, although the range was from 35% (in the < 300 category) to 49% (in the <1000 size category). This suggests that school size does not appear to be related to the hiring or retaining of teachers with more advanced education.

Teacher-Student Ratios. Small high schools in the study were found to have more favorable teacher-student ratios. As Figure 2 illustrates, teacher-student ratios increased as school size increased. An ANOVA revealed a significant difference between the < 300 school size category and the 750-1000 and > 1000 school size categories.



In summary, in response to the research question, do educational programs vary in different size schools, it appears that again, the answer is yes and no. The answer is yes when referring to extra-curricular activities and teacher-student ratios. Students in the medium to larger schools were spending more time on sports and hobbies than students in the smaller schools. A look at teacher-student ratios revealed that the smaller schools in

the study had more favorable teacher student-ratios (14 compared to 17). The pattern indicated that teacher-student ratios increased as school size increased.

Returning to the research question, the answer is no when referring to curriculum offerings and teacher educational attainment. Although findings indicated that larger schools were offering more AP math and science courses than smaller schools, only a small percent (2-18%) of students were actually benefiting from the advanced curriculum. In addition, when looking at the percent of schools that offered a core curriculum, there was substantial variation among the school sizes, with no real patterns identified. Analysis of course failures and time per week spent on homework also did not yield any identifiable patterns. Finally, teacher educational attainment did not appear to be related to school size, with percentages ranging from 35% (in the < 300 category) to 49% (in the > 1000 size category).

Does School Culture Vary in Different Size Schools?

Several aspects of school culture were investigated in the study, including school safety, social behavior, teacher's relationship with students, and parental involvement; areas that were addressed in the Students Speak Survey. The items on the survey were on a 5-point Likert scale ranging from "1" indicating *strongly disagree* to "5" indicating *strongly agree*; a selection of "3" indicated *don't know*. Table 6 lists the means of the items in the survey that related to each of the four aspects of school culture.

Table 6
Mean Response from Students on Items Relating to School Culture

Survey Item	< 300	300-450	450-600	600-750	750-1000	> 1000
<u>School Safety</u>						
“I feel safe at school”	3.58	3.59	3.50	3.57	3.33	3.40
“I have been threatened either verbally or physically at school by another student”	2.83	2.82	2.83	2.86	2.95	2.85
<u>Social Behavior</u>						
“Students show respect for each other”	2.83	2.94	2.72	2.79	2.61	2.66
<u>Teacher’s Relationship with Students</u>						
“Teachers show respect to students”	3.38	3.33	3.29	3.33	3.31	3.36
“Teachers care about my problems and feelings”	3.13	3.07	3.07	3.10	3.10	3.05
“Teachers help me to succeed”	3.62	3.54	3.58	3.62	3.57	3.63
“Teachers tell me I do a good job when I try my best”	3.53	3.46	3.52	3.53	3.58	3.61
“I have a teacher who is a positive role model for me”	3.60	3.58	3.69	3.69	3.69	3.66
<u>Parental Involvement</u>						
“My parents know what happens at my school”	3.32	3.24	3.18	3.21	3.17	3.17

School Safety. In general, most students across the different school size categories agree with the statement, “I feel safe at school,” although quite a few selected “3” indicating a *don’t know* response. However, students in the small to medium school size categories (< 300, 300-450, 450-600, and 600-750) significantly agreed more with the statement than students in the 750-1000 and > 1000 size categories. In response to the statement, “I have been threatened either verbally or physically at school by another student,” an ANOVA revealed there were no significant differences between the groups. Although it appears that most students at all school size levels have not been personally threatened at school, students in the larger schools, however, expressed not feeling safe at school more

often. This could be due to the fact that larger schools, simply by having more students, lessen students' general level of comfort and safety, thus, causing them to feel less safe at school.

Social Behavior. There were differences between the school size categories in response to "Students show respect for each other." The means for this item ranged from 2.61 to 2.94, indicating that most students disagreed with the statement. Nevertheless, the two highest scores, indicating that less students disagreed with the statement belonged to the < 300 and 300-450 school size categories. The two lowest scores, indicating that students disagreed with the statement more often, belonged to the two larger school size categories, 750-1000 and > 1000. One possible reason why students in smaller schools agreed more with the statement may be that it is easier to be disrespectful to people you do not know rather than to people you do know. A characteristic of small schools is that students usually know each other more, where in larger schools it is easier for students to be unknown.

Teacher's Relationship With Students. There were no significant differences between the school size categories for two items pertaining to teachers respecting students ("Teachers show respect to students," and "Teachers care about my problems and feelings"). The means for these items ranged from 3.05 to 3.38, indicating that most students gave a "3" *don't know* response.

There were two items on the survey that related to teachers encouraging students. There were no significant differences between the groups for the first item, "Teachers help me to succeed." Analysis of the second item ("Teachers tell me I do a good job when I try my best"), however, did yield significant results. The highest mean scores,

belonging to size categories 750-1000 and > 1000 were significantly different from the lowest mean score which belonged to the 300-450 school size category. Nevertheless, the indication is that although many students gave a response of “3” (*don't know*), most students from all school size categories agree that their teachers encourage them.

In response to the item, “I have a teacher who is a positive role model for me,” students across all school sizes tended to agree with the statement. Nevertheless, there were significant differences between the 300-450 school size category and the 450-600, 600-750, and 750-1000 school size categories, indicating that students in medium to large schools appeared to agree more with the statement.

Parental Involvement. An ANOVA revealed there were no significant differences between the schools in response to, “My parents know what happens at my school.” Most students across the different school size categories agree with the statement, however the trend appears to be less positive as school size increases. Another question that addressed parental involvement came from the Census survey, which asked principals to indicate the percent of parental involvement in school curriculum and assessment. Although there were no significant differences among the school sizes, there was a pattern that indicated that as school size decreased, parental involvement increased.

In summary, in regards to the four aspects of school culture that were explored in this study, it appears that yes, school culture does vary in different size schools. However, there is no clear-cut pattern indicating in favor of either small schools or large schools. Students in small schools reported feeling more safe at school than students in larger schools. Students in small schools also seemed to agree more with the statement, “Students show respect for each other,” indicating closer interpersonal relations among

students than in the larger schools. However, although students from all school size categories agreed that teacher's respected them, encouraged them, and were a positive role model for them, students in the medium to larger schools seemed to agree more with the statements. It appears that although the one-on-one interaction is less in larger schools (due to the teacher-student ratios), teachers in larger schools are maintaining personable relationships with their students. In regards to parental involvement, it appears that the trend is less positive as school size increases; suggesting that more parents are involved in smaller schools than in larger schools.

Do Student Attitudes Vary in Different Size Schools?

Two aspects of student attitudes, time per week spent on community and volunteer work, and types of influences, were examined in the study. An ANOVA revealed that students in the 300-450 and 450-600 school size categories spent significantly more time on community and volunteer work than students in the 600-750 school size category. It is interesting to note that those students (from the larger schools) who reported spending a lot of time in sports and hobbies (as mentioned earlier in the paper) did not report spending a lot of time in community or volunteer work. It appears that students from the smaller schools may have a closer connection to their community than students in larger schools, as indicated by their time spent on community and volunteer work.

Influences are an important aspect of teenage life and can greatly influence teenagers' beliefs and attitudes. The Student Speak Survey explored this concept and asked students to indicate how much school, church, the media, family, and friends

influenced their current plans for the future. Students reported being mostly influenced by their family, followed by school, friends, the media, and church. Students in the > 1000 school size category were more influenced by the media than students in all other categories, although means were in the “2’s” indicating a response of “*A little.*”

In response to the research question; yes, it appears that student attitudes do vary in different size schools. Students in smaller schools spend more time on community and volunteer work, while students in larger schools spend more time on sports and hobbies. All students appear to be influenced mainly by their family, which was a refreshing discovery, since family support is always important, especially during the high school years. However, students in the larger schools appear to be more influenced by the media than students in smaller schools.

Discussion

Findings from the study indicate that there is no consistent pattern when investigating the benefits of small and large high schools in Maine. It really depends on what is being examined. In some instances, such as high school graduation rates, teacher-student ratios, and parental involvement, smaller schools appear more favorable. In other instances, such as cost and participation in extra-curricular activities, larger schools appear more favorable. Finally, in other instances, such as curriculum offerings and MEA student achievement, there appear to be no differences at any given school size.

The intent of this study was to analyze four-year public high schools in Maine in a manner never done before. Findings from the study revealed that the issue of high school size in Maine is not so black and white as maybe it was thought to be. However, some

findings could be attributed to the quality and quantity of data, and care in interpreting the data is warranted. A more thorough, prospective study may be needed in which variables to be examined are carefully defined. Nevertheless, it is the goal of the researcher that the information gathered from this study is used to inform discussion among educators and relevant stakeholders in the state and that decisions regarding school size be carefully weighed against the various factors and implications presented in this paper.

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