SMALL SCHOOLS IN SMALL SCHOOL DISTRICTS AND SMALL SCHOOLS IN LARGE SCHOOL DISTRICTS: ARE THERE COST DIFFERENCES THAT SHOULD BE CAPTURED IN THE SMALL SCHOOL ADJUSTMENT OF THE WYOMING SCHOOL FUNDING FORMULA?

Final Report

Prepared for

THE WYOMING LEGISLATIVE SERVICE OFFICE

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November 23, 2004

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Executive Summary

The purpose of this study was to see if the cost structure of small schools located in large Wyoming school districts differed from the cost structure of small schools located in small districts across the state, and if a difference was found to recommend possible changes to the small school adjustment in the Wyoming school funding model. To answer this question we undertook four separate analyses:

1. A review of the literature on economies of scale in education.

2. A comparison of the characteristics of small schools in large districts with small schools in small districts

3. A comparison of the revenues generated by small schools through the funding model with the amount districts report being spent at each of the small schools.

4. Interviews with superintendents and business managers in large districts.

Our review of the literature suggested that Wyoming is correct in its assumption that there are additional per pupil costs of operating small schools. However, our analysis did not find any evidence – or any specific research – as to whether the size of a school district also impacts those measures of economy of scale.

In comparing the characteristics of small schools in large districts with those in small districts, we found few statistically significant differences in such things as pupil/staffing ratios, expenditures per pupil and student characteristics. In those few areas where the differences appeared to be statistically significant, we did not find any consistent patterns to explain those differences.

Our analysis of the funds generated by small schools suggested that many small schools generate more revenue through the funding formula that districts report spending in those districts. Since the purpose of the small school adjustment is to provide for the additional costs of operating schools with low enrollments, and not to fully fund the operations of the small schools, for each small school win Wyoming, our analysis estimated the revenues generated through the base

prototype formula (for personnel and non-personnel costs only at the school), added the small school adjustment generated by the enrollment at a specific school, and compared that figure to reported school level expenditures for 2002-03. This analysis – which may have underestimated revenues generated by many schools since the at risk adjustment and adjustments for teacher experience and education were not included in the adjustment – suggested that most small schools in Wyoming generate more revenue that districts currently allocate to those schools for their operation. We believe further analysis of this issue is warranted prior to making any adjustments to the small school formulas in the Wyoming school funding system.

Finally, we conducted interviews with superintendents and business managers of large school districts. We found that small schools in large districts appear to exist either because they are located in sparsely populated remote regions of the state – despite their location in a large district; or they exist because "in town" enrollments are insufficient to meet the thresholds. In the case of the small rural schools, there is no reason to assume the cost structure of those schools differs from the cost structure of similar schools located in smaller districts. In the case of the larger schools in these large districts, the current funding model provides a relatively small per pupil adjustment, and more research on the costs associated with enrollments at or near the prototype thresholds is needed before it is possible to say with certainty that an alternative to the current small school adjustment would more accurately reflect the "costs" of providing the educational basket required by the Wyoming Courts.

As a result of our research and analysis, we recommend that the Legislature not make any further adjustments to the small school formula for the 2005-06 school year. Instead, we recommend further consideration of the small school adjustment generally, and consideration of the need for a different adjustment in large districts be part of the recalibration discussion expected to take place next year.

I. INTRODUCTION

One of the most vexing problems in school finance is how to provide adjustments in funding formulas for districts that have schools with low enrollments. There is ample evidence that the per pupil costs of such small schools exceed those of larger schools, yet in many instances, the presence of such small schools is necessary due to the residential patterns of students throughout a school district and state. This problem has received a great deal of attention in Wyoming, where a high percentage of the schools across the state are relatively small. In fact, adjustments for the additional costs of small schools (and districts) has been a matter of almost constant discussion since the state implemented its current school finance structure in response to the Wyoming Supreme Court's initial ruling in *Campbell v. Wyoming*[1].

In *Campbell I*, the Court ruled that Wyoming must determine what constitutes a proper education, estimate the basket of educational goods and services needed to deliver that education and pay for the costs of that basket. In the ensuing years, a model to distribute funds to schools has been developed and modified a number of times. One of the most debated parts of that model is the adjustment for small schools. For the 2004-05 school year, a number of modifications to the small school adjustment were enacted. Under those changes (as with all previous versions of the adjustment) small schools were treated as small schools regardless of the district where they were located.

As funds are distributed to districts under the new small school adjustment, and in response to findings within the 2003 review of the adjustment, members of the Legislature want to know if the costs of operating small schools in a large district differ from the costs of operating small schools in small districts. Although discussed during deliberations over the current adjustment, the matter was held over for further study. At the request of the Wyoming Legislature's interim Committee on Education, this study was conducted by Lawrence O. Picus and Associates to ascertain whether or not such differences appear to exist and if they do, how, if at all, the funding formula should be modified.

The questions we answer in this report are:

- Is there a difference in the costs of operating small schools in large Wyoming school districts compared to operating small schools in small Wyoming school districts?

- If such cost differences are found, should the cost based funding model be modified to accommodate those different cost structures?

To answer these questions, we undertook a number of studies of small school costs in Wyoming. We conducted four separate analyses as follows:

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[1] *Campbell County School District v. State*, 907 P2d 1238 (Wyo. 1995), Hereinafter referred to as *Campbell I.*

1. An extensive review of the literature on economies of scale in education.

2. A comparison of the characteristics of small schools in large districts with small schools in small districts to see if there are statistically significant differences in those characteristics that can be ascribed to the size of the school district. The analysis focused on the following characteristics of schools:

   - Student enrollment (ADM)
   - Percent of students identified as at risk
   - Population density
   - Distance to the district central office
   - Staffing ratios

3. A comparison of the revenues generated by small schools through the funding model with the amount districts report being spent at each of the small schools.

4. Interviews with superintendents and business managers in large districts to enhance our understanding of how small schools in large districts are managed and organized.

The balance of this document describes our findings in these four areas. Section III reviews the literature on economies of scale in education, Section IV provides the comparisons of small schools in large and small districts; section V compares the revenue generated by Wyoming small schools with expenditures in those schools, and Section VI summarizes the results of our interviews with school superintendents and business managers. Our conclusions are presented in Section VII.

We begin with a short history of the small school funding formula in Wyoming.

II. RECENT HISTORY OF THE SMALL SCHOOLS FUNDING ADJUSTMENT

Because of the additional costs incurred in the operation of small schools, Wyoming's funding formula has included an adjustment to compensate for those additional costs. *It is important to note that the purpose of this adjustment in the current funding model is not to fully fund small schools, but rather to supplement the base funding system to fund the additional costs experienced by those small schools.* The analysis in this report is designed to ascertain whether or not the current adjustment accurately reflects the additional costs experienced by large districts that operate small schools as currently defined in the Wyoming funding model.

The First Response (*Campbell I*)

In response to the Wyoming Supreme Court's *Campbell I* ruling in 1977, a separate adjustment for small schools was included in the state's cost-based block grant funding model. The first iteration of the small-schools adjustment provided additional funding for elementary schools serving grades K-8 with average daily membership (ADM) of less than 201, and secondary schools serving grades 9-12 with ADM of less than 401 students. For schools with very small

ADM enrollments – elementary schools with 30 students or fewer and high schools with 48 students or fewer – the small school adjustment took the form of a flat sum of money provided to help pay the expenses of operating the school. The adjustment (additional funding) for elementary schools with ADM of 31-200 students and high schools with ADM of 49-400 students was provided on a per ADM basis, with the per ADM level of the adjustment declining as enrollment approached 200 for elementary schools and 400 for high schools. No adjustment for small school size was provided above these enrollment levels.

Campbell II Ruling

This first iteration of the small-school adjustment was ruled unconstitutional by the district court in *Campbell II*[2] on the grounds that the very small-school prototypes, the gradually decreasing per-pupil funding levels, and the five-mile provision (to limit funding of multiple schools within a five-mile radius) were not cost based and the funding levels were not adequate to deliver the basket of educational goods and services required in *Campbell I*.

In response to the district court, a 1998 Special Session of the Wyoming Legislature revised the small schools formula to provide very small schools – elementary schools with ADM of less than 30 students and high schools with ADM of less than 48 students – with straight-line (i.e. per pupil) funding between the very small-schools prototypes. The Legislature also provided for reimbursement for costs actually incurred for items such as student activities, utilities, and food service.

The 2001 Revisions to the Small School Adjustment

In 2001 the district court again declared the small-school funding adjustment unconstitutional on the grounds that the 2000 formula was not cost based. The Wyoming Supreme Court agreed with the district court and ruled that the formula was not cost based, that the cutoff sizes of 200 and 400 students were arbitrary, and that the reimbursement for student activities, utilities, and food service were not justified.

2002 Modifications

In 2002, the Wyoming Legislature revised the small-school funding adjustment again. This iteration of the funding formula attempted to tie the formula to the personnel and non-personnel items required to deliver the education basket as defined in the school-level prototypes. To address the Court's concern about the arbitrariness of the small school cut off points, all schools with enrollments (ADM) below the prototype enrollments receive a small school adjustment. Relying on available state data, teacher and non-teacher costs were estimated through a regression analysis and the results of those regressions were used to establish the per pupil adjustments provided to small schools. The effect of this was again to provide a declining per pupil adjustment as enrollment approached the prototype enrollment sizes.

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[2] *State v. Campbell County School District*, 19 P.3d 518 (Wyo. 2001). Hereinafter referred to as *Campbell II.*

2003 Revisions to the Formula

In 2003, the Wyoming Legislature revised the small school adjustment again. Using newly collected school level personnel and non-personnel data for the 2002-03 school year, the 2003 small school adjustment estimated the number of specific personnel in each category within each school-level prototype, and provided funding for the requisite number of people at those levels. . The 2003 formula also estimated the costs of non-personnel items found in the respective prototypes. Whereas the 2002 formula estimated the portion of teacher costs as a proportion of total school-level costs, the new school-level data provided the opportunity to estimate each category separately.

In the model, personnel and non-personnel costs were estimated through regression analysis using newly available school-level data from the WDE. The new formula provided gradually declining per-pupil funding adjustments for all ADM levels below the prototypical ADM associated with elementary, middle, and high schools, respectively. Additionally, the 2003 formula revision provided for minimum teacher allocations for each school level to ensure adequate numbers of instructional staff to effectively deliver the basket of services to schools at the lowest end of the ADM spectrum. This is the small school adjustment that is used in the model to distribute funds to school districts for the 2004-05 school year and will be used again for 2005-06 unless the Legislature decides to make further changes in the adjustment.

During the initial analysis for the 2003 small-schools formula adjustment, there was speculation that the additional costs of small schools in large districts were different than those in small districts. The break point between large and small districts for this analysis is the point at which districts no longer receive additional funds through the small district adjustment in the Wyoming funding formula, or an ADM of 2,346 students. The question that emerged from data analysis and site visits to Wyoming schools is, can large districts provide assistance to their small schools more efficiently than small districts? Specifically, can larger districts provide specialized staff and non-personnel resources such as professional development, more economically than small districts? Rather than adopt a differential formula, the Wyoming Legislature elected to study the matter further. Before considering data specific to Wyoming, the next section of this report reviews the current literature on economies of scale in educational settings.

III. LITERATURE REVIEW: ECONOMIES OF SCALE IN EDUCATIONAL SETTINGS

The impact of school or district size on the unit costs of operation is a question researchers have sought to understand for decades. So called economies of scale measure how marginal costs vary with the size of the organization and its output. While it is generally assumed that as an organization grows, these per unit costs decline, it is important to understand how those costs decline, and at what point – if any – the savings no longer accrue and marginal or unit costs begin to increase again.

In the case of education, as with many other publicly provided services, the outcome measure to be used is difficult to narrow to just one. Schooling provides many different services to children and communities including, but not limited to academic achievement as measured by standardized test scores, graduation rates, retention rates, sports and co-curricular activities, and post-secondary education and job placement rates. The level of school output in any given community is selected by voters depending on factors such as the district's income, tax price, intergovernmental grants, and other factors.[3]

Two similar methodologies have been used to measure economies of scale in education, the cost function and production function methodologies. In both methodologies, researchers work to determine the cost factors affecting some measure of schooling outcomes. Baker and Duncombe, summarizing these methodologies, divide these cost factors into two categories, those affecting student needs and those affecting district needs.[4] Factors affecting student needs include indicators such as student poverty, English proficiency, and special education. District needs are those factors that affect the costs of doing business across schools or districts, including size of enrollment.

Cost function analysis attempts to estimate the costs of operations holding constant student outcomes and other district- and student-needs factors including enrollment. Using regression analysis, per-pupil expenditures are regressed on schooling outcomes and district and student needs. Production function analysis, similarly, estimates the effects of schooling inputs (pupil-teacher ratios, teacher characteristics, enrollment, and indicators of student needs) on schooling outcomes. Again, using regression analysis, schooling outcomes are regressed on district and student needs.

Baker and Duncombe point out in their summary of economies of scale research and in their review of school-finance formulas across the nation, that most studies and formulas tend to ignore population sparsity. They feel that sparsity and enrollment, together, are better indicators of economies-of-scale needs than enrollment alone. Sparsity, as measured by such things as pupil density (number of pupils per square mile) is a preferred indicator of this characteristic compared to the use of distance between schools. This is because the number of pupil per square mile is a is a measure outside the control of school districts whereas school location decisions are controlled by school districts. Measuring enrollment only would subsidize geographically small districts/schools even when consolidation is feasible. Of the state school-finance formulas they reviewed, Baker and Duncombe found that 16 states adjust their basic operating aid system by district enrollment, 12 by school enrollment, three using both, and 16 states include some adjustment for sparsity or isolation – two use population density and most use distance between schools.

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[3] Ratcliff, K., B. Riddle, and J. Yinger. 1988. "The Fiscal Condition of School Districts in Nebraska: Is Small Beautiful?" *Economics of Education Review* 9 (1990): 81-99.
[4] Baker, B. and W. Duncombe. 2004. "Balancing District Needs and Student Needs: The Role of Economies of Scale Adjustments and Pupil Need Weights in School Finance Formulas." *Journal of Education Finance* Volume 29, Number 3, Winter 2004: 195-221.

Research Results

Most of the research on economies of scale conducted at the district level has relied on cost function analysis. Summarizing the literature on economies of scale, Andrews et. al. conclude that almost all studies at the district level have consistently found some degree of economies of scale.[5] That is, as the size (enrollment) of the district grows larger, the costs of education, holding constant education quality, become smaller. Most cost function studies include both enrollment and the squared term of enrollment to allow for a parabolic or U-shaped curve, relationship. These cost function studies have indicated that maximum economies of scale are achieved in districts with enrollments between 2,000 and 6,000 students. Smaller and larger districts are estimated to incur higher per pupil costs.

Most of the research at the school level has used production function analysis. Unlike district enrollment, the results of analyses estimating the effects of school size on schooling outcomes is less conclusive and consistent. Whereas the district-level analyses indicate lower costs as enrollment increases, holding constant schooling outcomes, some school-level analyses have shown that increasing school size lowers student performance.[6]

Bowles and Bosworth studied economies of scale at the school level in Wyoming using the cost-function approach.[7] In their study, Bowles and Bosworth found that an increase of 10 percent in school size decreased costs per student by approximately two percent. Further analysis of their data suggested that district effects were significant to the cost structure and concluded that different districts have different cost functions. This finding is important for the current study although the Bowles and Bosworth study does not provide evidence as to what the causes of those differences are, and as described below, district size – at least as defined in this work – does not appear to be a substantially determining factor in the costs of operating small schools.

[5] Andrews, M., W. Duncombe, and J. Yinger. "Revisiting Economies of Size in American Education: Are We Any Closer to a Consensus?" *Economics of Education Review* 21 (2002): 245-262.
[6] For example, see "High School Size: Which Works Best and For Whom?" V.E. Lee and J.B. Smith, *Educational Evaluation and Policy Analysis*, 19(3), 1997, 205-227.
[7] Bowles, T. and R. Bosworth, "Scale Economies in Public Education: Evidence from School Level Data." *Journal of Education Finance*, 18 (Fall 2002), 285-300.

IV. Are Small Schools In Large Districts Different Than Small Schools In Small Districts?

Descriptive statistics for Small Schools

The first step in analyzing whether or not there are cost differences in small schools due to district size is to analyze the characteristics of the small schools themselves. Small schools in Wyoming are categorized into seven primary categories, provided for by the Wyoming Department of Education (WDE). Schools are categorized as follows:

- Elementary (typically serving any combination between grades K-6)
- Elementary/Middle (typically serving any combination of grades K-9)
- Middle (typically serving grades 6-8)
- Junior High (typically serving grades 7-9)
- High (typically serving grades 9-12)
- Secondary (typically serving grades 7-12)
- K-12

For purposes of this analysis, middle schools and junior high schools were combined into a single category called Middle Schools based on their similarities in grade structure and educational programs. Table 1 displays the number of small schools within each category in 2002-03 in small districts and large districts.[8]

Table 1: Number of Small Schools by Category and District Size

Category	Number in Small Districts	Number in Large Districts
Elementary	81	62
Elementary/Middle	8	11
Middle	36	6
High School	44	8
Secondary	6	4
K-12	2	1
Total	177	92

Source: Wyoming Department of Education

[8] We used a one-year ADM count to determine if a school is considered a small school. Although the 2003 small-schools funding adjustment will utilize a three-year average ADM, these data are not fully available for all schools at present. Thus trying to use the three year average would lead misleading averages ADM and complicate comparisons of pupil-staff ratios and per-pupil funding.

Given the extremely small number of K-12 schools in the state (three), they were dropped from the analysis . In addition, there are a very small number of schools in the elementary/middle and secondary school categories making statistical tests more difficult to interpret. Although we include them in the analyses that follow, readers should recall that they only represent 29 schools (19 elementary/middle and 10 secondary).

The first step in our analysis was to ascertain whether or not there are significant differences in the characteristics of small schools in small and large districts. To conduct this analysis we relied on a difference of means statistical test.[9] For each resource identified below, we compare the mean for small schools in small districts with the mean for small schools in large districts. Our assumption in these tests is that there is no statistical difference between the two groups (the null hypothesis). If there is a difference between the two, then we can begin to analyze the cause of those differences with an eye toward consideration of different small school adjustment formulas for large and small districts. The standard confidence level used to determine a statistically significant difference is five percent (0.05). However, given the small number of schools in most categories used in this analysis, a ten percent (0.10) confidence level is generally used.

Interpretation of the findings below regarding small high schools is complicated by the fact that most small high schools in large districts are alternative schools. The purpose of these schools is to provide an educational environment for those children who can not succeed in larger high schools, and thus may experience higher educational costs regardless of size. Consequently, throughout this report analyses were performed on all high schools (including alternative schools) and separately on non-alternative high schools. Any significant differences between these two designations are reported throughout this document.

School-Level ADM

Comparisons of Wyoming small schools begin with the size of the school as measured by average daily membership (ADM). In the case of elementary schools, small elementary schools in small districts (average ADM of 111 students) are significantly smaller than small elementary schools in large districts (average ADM of 143 students). This difference is significant at the 0.05 confidence level. The mean school ADM in schools categorized as elementary/middle, middle, and secondary were not statistically different across district size.

High schools, as a whole, appear to be significantly different based on district size. Unlike elementary schools, small high schools in small districts have larger ADM (average of 174 students) than small high schools in large districts (average of 57 students). This difference is statistically significant at the 0.05 confidence level. However, when alternative schools are excluded from the analysis – four in small districts and six in large districts – no statistically significant difference at the 0.05 level in the average size of the schools was found. However, at the less stringent standard of 0.10 the difference in means is statistically significant (mean ADM of 178 in small districts and 47 in large districts). The reason this finding is so weak is likely the

[9] Details on our methodology are provided in Appendix A.

result of so few small high schools in large districts (two when the alternative schools are removed from the analysis).

At-Risk Population

Another cost factor that might impact resource allocations in small schools is the proportion of students at a school who are considered to be at risk of failing. Wyoming uses a proxy measure to determine the number and proportion of at-risk students in a school by taking an unduplicated count of students eligible for the federal free-and reduced-lunch program and students identified as limited English proficient (LEP). Our analysis compared the percentage of at risk children in small schools in small districts with the percentage in small schools in large districts.

In schools categorized as elementary/middle schools, there was a statistically significant difference at the 0.05 confidence level with schools in small districts having an average of 41 percent at risk students compared to 14 percent in large districts. Small elementary, middle, high, and secondary schools did not exhibit statistically significant differences in the average proportion of at-risk students by district size.

Population Density

Based on the literature on economies of scale in schools and school districts, measures of remoteness are good indicators of cost differences in schools. Thus one potential cost differential is the number of children within a given radius of small schools. Utilizing geographic information systems (GIS) data provided by the Wyoming Legislative Services Office (LSO), the population density of people age 18 or younger surrounding small schools was analyzed. Mileage radii of three miles, five miles, ten miles, and 20 miles around each school were analyzed. Since the results from all four radii thresholds were highly consistent, only the results from the three-mile radius are presented here.

In most cases, small schools in small districts had population densities within a three-mile radius significantly lower than small schools in large districts. Small elementary (18 small v. 161 large), middle (15 v. 85), and high (24 v. 103) differences were statistically significant at the 0.05 confidence level while the differences in secondary schools (17 v. 202) were statistically significant at the 0.10 confidence level.

The average population density in a three-mile radius surrounding small elementary/middle schools were found to not be statistically significant even though the differences (3 in small districts v. 43 in large districts) appear to be large, *prima facie*. Also, when high schools are analyzed excluding alternative schools, the mean population densities are not significantly different than one another. An interesting outcome of this analysis is how the population densities surrounding small, non-alternative high schools in small districts are greater than small, non-alternative high schools in large districts, 20 v. 3. Small sample sizes and large standard errors in both the elementary/middle and non-alternative high schools lead to results that are not statistically significant.

The few significant findings in this analysis do not suggest different cost structures in small and large districts, but rather appear to be a function of the overall geographic size and composition of the large districts and their need to provide school services for children who reside far from the central town where the district office is located. To that extent, some of the small schools in these larger districts seem to share more characteristics with small schools in small districts than they do with schools in large districts.

Distance to District Office

Another set of GIS data analyzed in an attempt to measure levels of remoteness or isolation is the distance of each school from its respective central district office. In theory, those schools further away from the central administration office would have a more difficult time relying on district-level resources and would require more school-based staff and thus would be more costly.

Contrary to our initial hypotheses, schools categorized as elementary/middle, middle, and non-alternative high schools in small districts were closer to their central administration offices than were the respective small schools in large districts. Small elementary/middle schools in small districts were significantly closer to their central administration offices (17 miles), on average, than were small elementary/middle schools in large districts (35 miles), significant at the 0.10 confidence level. Small middle schools followed the same pattern at 10 miles versus 23 miles, significant at the 0.10 confidence level, and small high schools at nine miles versus 40 miles, significant at the 0.05 confidence level.

Average distances to central administration offices in small elementary and secondary schools and high schools as a whole (including alternative schools) were not statistically different based on district size.

Analysis of School Level Resources

To determine whether there are cost differences between small schools in small districts and small schools in large districts, several sets of analyses were performed in four broad areas: school-level staffing, school-level non-personnel expenditures, district-level staffing, and teacher characteristics (experience, education, and salary). These analyses were conducted with data from the Wyoming Department of Education. Only data from 2002-03 were available for these analyses. As more years of data become available, the larger number of observations will establish more confidence in the results and, more importantly, the interpretation of those results.

School-Level Staffing

The school-level data collected by WDE provides for relatively straightforward analyses of each personnel category within each school-level prototype. Rather than use the raw number of personnel in each school, pupil-staff ratios were calculated to facilitate comparisons across groups and school sizes.

Table 2 illustrates the average pupil-staff ratios in small elementary schools in Wyoming by district size. In each case, a difference-in-means statistical test was performed to determine if the averages between the two groups were statistically different from one another.

In the case of elementary schools, only the pupil-teacher and pupil-professional support staff ratios were significantly different across district size. In both personnel categories, small elementary schools in small districts had lower pupil-staff ratios, i.e., more school personnel per student, than small elementary schools in large districts. In all other personnel categories and the teacher-administrator ratio, the averages between the two groups were not statistically different from one another.

Table 2: Pupil Staff Ratios in Small *Elementary* Schools by District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	12.6	14.4	Yes
Instructional Aides	75.3	75.0	No
Librarians	325.5	402.0	No
Library Aides	197.2	186.3	No
Pupil Support-Professional	364.5	517.0	Yes
Pupil Support-Classified	*	*	*
Administration	222.4	219.6	No
Counselors	301.8	304.6	No
Clerical	131.9	137.6	No
Teacher-Admin Ratio	16.6	15.4	No

*Insufficient data for this category
**Significant at the 0.10 level

Table 3 illustrates the average pupil-staff ratios in small elementary/middle schools in Wyoming by district size.

Table 3: Pupil Staff Ratios in Small *Elementary/Middle* Schools by District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	7.0	7.1	No
Instructional Aides	74.3	85.2	No
Librarians	*	*	*
Library Aides	*	*	*
Pupil Support-Professional	*	*	*
Pupil Support-Classified	*	*	*
Counselors	132.4	283.1	*
Administration	91.6	101.4	No
Clerical	211.0	78.2	No
Teacher-Admin Ratio	10.1	17.4	No

*Insufficient data for this category
**Significant at the 0.10 level

Small elementary/middle schools exhibited no personnel categories with statistically significant differences in average pupil-staff ratios by district size. Because of the small number of schools categorized as small elementary/middle schools, the statistical tests could not be performed for some personnel categories because one or both groups did not have reported values.

Table 4 illustrates the average pupil-staff ratios in small middle schools in Wyoming by district size.

Table 4: Pupil Staff Ratios In Small *Middle* Schools By District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	13.1	9.9	Yes
Instructional Aides	197.9	84.4	No
Librarians	*	*	*
Library Aides	265.4	232.3	No
Pupil Support-Professional	298.0	994.9	Yes
Pupil Support-Classified	*	*	*
Counselors	221.5	1266.5	Yes
Administration	189.1	115.8	Yes
Clerical	138.1	86.5	Yes
Teacher-Admin Ratio	14.6	13.0	No

*Insufficient data for this category
**Significant at the 0.10 level

Small middle schools had statistically significant differences in averages in the pupil-teacher, pupil-professional support, and pupil-counselors ratios. The pupil-administrator and pupil-clerical ratios were also statistically significant at the 0.10 confidence level. In the case of teachers, administrators, and clerical staff, the pupil-staff ratios were higher in the small schools in small districts compared to small schools in large districts, i.e., fewer staff per pupil in small schools in small districts than small schools in large districts. Conversely, in the case of pupil support (professional) and counselors, the pupil-staff ratios in small schools in small districts were smaller than small schools in large districts, i.e., more staff per pupil in the small schools in small districts than in large districts.

Table 5 illustrates the average pupil-staff ratios in small high schools in Wyoming by district size. There was not a statistically significant difference in average pupil-teacher ratios between the two groups. However, in the case of counselors and administrators, the average pupil-staff ratios of the two groups were statistically different from one another with instructional aides significant at the 0.10 confidence level. In all three cases, the small schools in small districts had higher average ratios than the small schools in large districts, i.e., fewer staff per pupil in the small-district schools than in the large-district schools.

Table 5: Pupil Staff Ratios In Small *High* Schools By District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	11.5	10.9	No
Instructional Aides	245.8	67.2	Yes
Librarians	325.8	529	*
Library Aides	302.5	151.3	No
Pupil Support-Professional	563.6	445.1	No
Pupil Support-Classified	*	*	*
Counselors	241.3	90.9	Yes
Administration	182.2	119.2	Yes
Clerical	123.7	114.4	No
Teacher-Admin Ratio	16.8	20.7	No

*Insufficient data for this category
**Significant at the 0.10 level

Table 6 illustrates the average pupil-staff ratios in small high schools, excluding alternative schools, in Wyoming by district size.

Table 6: Pupil Staff Ratios In Small *High Schools Excluding Alternative Schools* By District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	11.2	7.5	Yes
Instructional Aides	265.9	76.4	*
Librarians	*	*	*
Library Aides	302.5	151.3	No
Pupil Support-Professional	563.6	777.3	*
Pupil Support-Classified	*	*	*
Counselors	218.4	101.5	No
Administration	188.8	153.5	No
Clerical	128.4	211.3	Yes
Teacher-Admin Ratio	16.8	20.8	No

*Insufficient data for this category
**Significant at the 0.10 level

When the analysis of high schools excludes the alternative schools, a different pattern emerges. In the case of small, non-alternative high schools, the averages of the pupil-teacher and pupil-clerical ratios are significantly different, teachers at the 0.10 confidence level. In the case of teachers, the pupil-staff ratio is larger in the small schools in small districts compared to small schools in large districts, i.e., fewer teachers per pupil in the small-district schools than in the large-district schools. Conversely, the pupil-clerical ratio is smaller in the small-district schools than in the large district schools, i.e., more clerical staff per pupil. The average ratios for instructional aides, counselors, and administration were no longer statistically different by group when the alternative schools were excluded from the high schools analysis.

Table 7 illustrates the average pupil-staff ratios in small secondary schools in Wyoming by district size.

Table 7: Pupil Staff Ratios In Small *Secondary* Schools By District Size

Personnel Category	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Teachers	14.0	12.7	No
Instructional Aides	*	*	*
Librarians	*	*	*
Library Aides	220.3	243.1	No
Pupil Support-Professional	451.0	681.2	No
Pupil Support-Classified	*	*	*
Counselors	178.9	154.8	No
Administration	150.9	256.1	Yes
Clerical	72.1	77.3	No
Teacher-Admin Ratio	15.8	17.9	No

*Insufficient data for this category
**Significant at the 0.10 level

Analysis of small secondary schools was very difficult given the small number in each group. In many cases, there were no observations or too few observations to perform a statistical analysis within a given personnel category. Only in the case of pupil-administrator ratios was there a statistically difference in the averages between the two groups. At the 0.10 confidence level, the average pupil-administrator ratio in small-district schools was lower than in large-district schools, i.e., more administrative staff assigned to the schools per pupil in small schools in small districts than in small schools in large districts.

School-Level Non-Personnel Expenditures

In addition to personnel, the school-level prototypes in the Wyoming funding model include non-personnel items such as supplies and instructional materials, equipment, student activities, professional development, and assessment. Given the one-year nature of the data, analyzing these non-personnel items as a whole reduces potential erratic patterns. With several more years of data, analyzing each line item separately may provide more consistent results.

Table 8 shows the average school-level non-personnel expenditures per pupil by school level and district size. Total non-personnel expenditures were divided by school-level ADM to calculate a per-pupil expenditure figure.

Table 8: Non-Personnel Expenditures By School Level And District Size

School Level	Small Schools In Small Districts	Small Schools In Large Districts	Statistically Significant Difference**
Elementary	$1,050	$798	No
Elementary/Middle	$2,024	$2,952	No
Middle	$922	$976	No
High	$1,695	$1,157	Yes
Secondary	$1,453	$1,130	No

**Significant at the 0.10 level

Differences in average school-level non-personnel expenditures were not statistically significant except in high schools, a result significant at the 0.10 confidence level. Excluding alternative schools from the analysis changes the results tremendously. The average in small-district high schools increases slightly to $1,722, but the average in large-district high schools increases to $2,290. However, even though there is a larger difference in means, the difference is not statistically significant due to the very small number of observations in the analysis. In all, there appears to be no difference in the average per-pupil non-personnel expenditures at the school level.

District-Level Staffing

It has been suggested that larger districts have additional central office staff who can more easily assist and provide services to schools, creating efficiencies through the notion of cost sharing at the district level. The data from WDE provides two sets of district-level staff: central administration-defined staff from the district prototypes and district-assigned teachers. There were 38 districts defined as small (ADM of fewer than 2,346 students) and 10 districts defined as large (ADM of 2,346 students or greater).

Central Administration Staff

The district prototypes define six personnel categories: superintendent, business manager, curriculum and instruction, technology, clerical, and other central administration staff. The data collected by WDE reports the number of full-time equivalent (FTE) personnel in the above categories as well as an additional category of assistant superintendent.

Table 9 displays the differences in average number of central administration personnel by district size and Table 10 shows the differences in average pupil-staff ratios as a common unit of measure.

Table 9: Mean Number of Central Administration Staff By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Superintendent	0.87	1.00	No
Asst. Superintendent	0.32	2.10	Yes
Business Manager	0.91	1.14	Yes
Curriculum & Instruction	0.23	3.94	Yes
Technology	0.88	4.46	Yes
Clerical	1.63	11.23	Yes
Other Central Administration	20.99	111.25	Yes

**Significant at the 0.10 level

Table 9 shows that there are significant differences in the number of central administration personnel by district size. Not surprisingly, there are more central office administrators in large districts than in small districts. Table 10 provides the analysis of these personnel based on pupil-staff ratios.

Table 10: Pupil-Central Administration Staff Ratios by District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Superintendent	823	5,315	Yes
Asst. Superintendent	384	1,931	Yes
Business Manager	771	4,640	Yes
Curriculum & Instruction	303	1,277	Yes
Technology	535	1,853	Yes
Clerical	356	791	Yes
Other Central Administration	44	52	No

**Significant at the 0.10 level

In all personnel categories except other central administration staff, the differences in the average pupil-staff ratios by district size were statistically significant. In all cases, large districts serve more students per central administration staff member than do small districts suggesting economies of scale do exist at the district level. Of particular interest is the range of other central administration staff FTE in the small districts. At the low end of the spectrum, one small district employed 1.98 FTE other central administration staff while, at the other end of the spectrum, another small district employed 75.35 FTE other central administration staff. The exact roles and responsibilities of these other central administration staff is not captured by these data, but it appears that there is great variability in the number of staff both in small districts and large districts, alike.

District-Assigned Teachers

When delivering the educational basket of services, teachers and other instructional staff play an integral and central role. As a measure of potential cost sharing, district-assigned teachers may be able to provide services to students in schools and/or additional support to students and teachers at the school level. Table 11 shows the number of FTE district-assigned teachers and the pupil-teacher ratio as computed by the district-level ADM divided by the district-assigned teachers.

Table 11: District-Assigned Teachers By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Teachers (FTE)	0.61	3.78	Yes
Pupil-Teacher Ratio	1,322	12,338	Yes

**Significant at the 0.10 level

In gross numbers, large districts have more district-assigned teachers, on average, than small districts, a statistically significant difference. While most small districts do not have any district-assigned teachers, 16 small districts reported having district-assigned teachers, an average of 1.44 FTE teachers per district (this is different than what is reported in Table 11 which includes the districts with no district assigned teachers in the computation of the mean. Conversely, eight of ten large districts had district-assigned teachers, an average of 4.72 FTE teachers (The difference between this figure and Table 11 is the computation here of the non-zero districts). This difference of means is statistically significant as well.

As a comparable measure, the pupil-teacher ratio shows that, on average, large districts serve nearly ten times more students per district-assigned teacher than small districts. The difference in average pupil-teacher ratios is statistically significant at the 0.10 confidence level. When analyzing the pupil-teacher ratios of only those districts that reported district-assigned teachers, the results are similar and remain statistically significant.

What the data do not describe are the roles and responsibilities of these district-assigned teachers. However, large districts appear to hire more district-assigned teachers, staff that are not necessarily funded through the school-level or district-level prototypes and that these large districts are able to serve a greater number of students with each of these district-assigned teachers.

Teachers Experience, Education, Salary

Another source of potential cost differences is the cost of teachers. The data provided by WDE allows for an analysis of average teacher salaries, years of experience, and the educational backgrounds of teachers at the school level.[10]

1. Average Salaries

Table 12 describes the average salaries of teachers assigned to the school and district levels.

Table 12: Average Teacher Salaries By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	$37,467	$38,788	Yes
Elementary/Middle	$38,487	$35,567	No
Middle	$36,732	$37,091	No
High	$36,822	$35,792	No
Secondary	$35,923	$38,321	No
District-Assigned	$37,918	$37,230	No

**Significant at the 0.10 level

The average salaries of teachers in elementary schools are lower in small districts than in large districts, a statistically significant difference at the 0.10 confidence level. However, the average salaries for all other schooling levels and district-assigned teachers by district size were not statistically different.

Teacher Experience

Table 13 describes the average experience profile of teachers assigned to the school and district levels. The average experience of teachers in small-district elementary/middle schools is significantly greater at the 0.10 confidence level. Additionally, small-district high school teachers have significantly more experience than large-district high school teachers.

The experience profiles of school- and district-assigned teachers can be further broken down by the distribution of years of experience. The data from the WDE allowed us to break down the experience profiles of teachers into four categories: less than three years experience, three to five years experience, five to ten years experience, and ten years or more years experience. Tables 14-17 display the average proportion of teachers in each experience category by district size.

[10] The results of the salary, experience, and education analyses reported do not include alternative schools. Analyses that included alternative schools showed the same results.

Table 13: Average Teacher Experience In Years By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	14.1	12.7	No
Elementary/Middle	15.0	9.5	Yes
Middle	13.2	11.1	No
High	12.7	8.3	Yes
Secondary	10.7	11.8	No
District-Assigned	12.7	12.9	No

**Significant at the 0.10 level

Table 14: Teacher Experience Less Than Three Years By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	17.9%	23.9%	Yes
Elementary/Middle	6.1%	9.9%	Yes
Middle	19.0%	36.3%	Yes
High	25.1%	34.8%	No
Secondary	22.3%	24.3%	No
District-Assigned	7.5%	16.8%	No

**Significant at the 0.10 level

A larger average proportion of teachers assigned to elementary, elementary/middle, and middle schools in large districts have less than three years of experience, at the 0.10 confidence level.

Table 15: Teacher Experience Three To Five Years By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	8.1%	7.3%	No
Elementary/Middle	2.9%	10.2%	No
Middle	9.9%	2.8%	No
High	6.9%	14.5%	Yes
Secondary	22.4%	5.9%	No
District-Assigned	14.8%	2.0%	No

**Significant at the 0.10 level

Only in high schools is there a statistically significant difference in the average proportion of teachers with three to five years of experience by district size. In this case, the average proportion of high school teachers in large districts is statistically higher than in small districts at the 0.10 confidence level.

Table 16: Teacher Experience Five To Ten Years By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	13.8%	14.5%	No
Elementary/Middle	21.2%	14.0%	No
Middle	15.2%	8.9%	No
High	15.4%	23.3%	No
Secondary	16.8%	19.8%	No
District-Assigned	21.3%	28.3%	No

**Significant at the 0.10 level

There are no statistically significant differences in the average proportions of teachers with five to ten years of experience.

Table 17: Teacher Experience Ten Years Or More By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	60.2%	54.3%	No
Elementary/Middle	67.8%	35.8%	Yes
Middle	55.9%	52.0%	No
High	52.6%	27.3%	Yes
Secondary	38.6%	50.0%	No
District-Assigned	56.3%	53.0%	No

**Significant at the 0.10 level

At the other end of the experience spectrum, the average proportion of teachers with ten years of experience or more in elementary/middle (at the 0.10 confidence level) and high schools in small districts is higher than in those categories of schools in large districts. That is, a larger proportion of elementary/middle and high school teachers in small districts have more than 10 years of experience compared to teachers in large districts.

In all, it appears that teachers in small districts, on average, have more experience than their large-district counterparts. However, since the current Wyoming funding model provides differential funding for teachers on the basis of experience, there does not appear to be any reason to provide additional funding to small schools for these differences in experience – that is accommodated in the teacher salary portion of the funding model.

Teacher Education Level

The final teacher cost factor to be considered is level of education of teachers. More than 99 percent of teachers in all schools have at least a bachelor's degree. Likewise, there were no reported teachers with doctorate degrees. Table 18 describes the proportion of teachers that hold a masters degree by school level and district size.

Table 18: Teachers With A Masters Degree By District Size

Personnel Category	Small Districts	Large Districts	Statistically Significant Difference**
Elementary	23.4%	21.7%	No
Elementary/Middle	45.4%	30.6%	No
Middle	24.1%	5.9%	Yes
High	26.0%	16.8%	No
Secondary	26.1%	21.5%	No
District-Assigned	25.4%	24.9%	No

**Significant at the 0.10 level

Only in middle schools was there a statistically significant difference in the average proportion of teachers holding a masters degree. In this case, small-district middle school teachers, on average, have more education than large-district middle school teachers.

Summary

The analysis presented above does not indicate any clear distinction between small schools in large districts and small schools in small districts in Wyoming. There were few statistically significant differences in the characteristics of small schools in large and in small districts. While it is impossible to draw any specific conclusions from these data, it appears that the cost structure of small schools across the state either does not vary much, or if it varies, does so in ways that were not captured in this analysis. It is more likely that some other factor, such as the overall size of the school itself, may be more important than the type of district wherein the school is located.

V. Comparing Revenue with Expenditures in Small Schools

Since there were few school characteristics that suggested small schools in small districts have a different cost structure than do small schools in large districts, we conducted a second analysis looking at the revenues generated by small schools and comparing those revenues to the expenditures at those schools. This analysis could not have been done in the past as the first year for which school level expenditure data have been available in Wyoming was 2002-03. At the time of this analysis, we only had data for that year, and thus our analysis is somewhat limited, but as the discussion below shows, there were some very interesting results.

The purpose of the small school adjustment is to compensate school districts for the additional costs of operating schools with enrollments below the prototype enrollment levels (264 elementary, 300 middle and 600 high school). As designed in the current funding model, the small school adjustment does not fully fund small schools, but rather supplements the base funding system to supply adequate funding to meet the costs of operating small schools.

Many Wyoming school officials suggest that the small school adjustment is inadequate because the funding received by school districts through the small school adjustment is less than it costs them to operate the small schools. That analysis does not reflect the way the Wyoming funding model was designed to operate. Assessment of the adequacy of the small school adjustment should be based on a comparison of spending in small schools with the revenue generated through the base model *plus* the small school adjustment. To ascertain the adequacy of the small school adjustment, we made that comparison. Using the 2002-03 school funding model, we computed the base funding generated by small each small school in the state, and added to that figure the amount of money generated by the school through the small school adjustment. We then compared that figure to the reported spending at that school as reported to the Wyoming Department of Education.

The methodology for estimating revenues and expenditures by school is detailed in Appendix B. We began by estimating the base funding generated for each school by summing the personnel and non-personnel resources generated by the model for each school. The analysis only included those funds generated for school site purposes, and left out those resources specifically directed to central district functions. We added to that the funds generated through the small school adjustment in the model. We then subtracted from that figure the total expenditures for that school site as reported to the WDE. A positive result indicated the school generated more revenues than were spent at the site, while a negative result indicated the opposite.

Among all 48 school districts in the state, we identified 269 small schools. Among those 269 schools, 210 generated more revenue that was spent at the schools, while in 59 schools, expenditures exceeded the revenues generated by the schools. In large school districts, there were a total of 87 small schools. Among those 87 schools, 71 showed a positive balance and 16 a negative balance. In small districts, there were 182 small schools, 139 generating more revenue then spent and the site and 43 with less funding then expenditures. Table 19 summarizes our findings and provides estimates of the total funding involved.

Table 19: Comparison of Revenue Generation and Expenditure in Wyoming Small Schools 2002-03

Category	Small Districts	Large Districts	All Districts
Number of Small Schools	182	87	269
Revenue greater than expenditures	139	71	210
Expenditures greater than revenue	43	16	59
Funding Differences			
Average greater revenue ($)	135,908	132,132	134,632
Average greater expenditure ($)	(142,419)	(79,383)	(125,324)
Total greater revenue ($)	18,891,277	9,381,400	28,272,677
Total greater expenditure ($)	(6,124,037)	(1,270,127)	(7,394,165)
Net greater revenue ($)	12,767,239	8,111,273	20,878,512

These data suggest that overall the small school adjustment is not under funding small schools in large or in small districts. However, the reasons for these findings are not clear. There are a number of possible explanations including:

- The collection of school level data is a new effort in Wyoming, and the 2002-03 data used for this analysis represent the first year such data were collected. It is possible that school district officials were not certain how to report all expenditures. As a result, different reporting decisions could have been made by different individuals. If there were few consequences for the decisions that were made, the school level reporting may not have received the attention it requires to provide information accurate enough for this analysis.

- It is also possible that even at the level of detail for which data were collected that year, more sophisticated measures may be needed to fully understand the effects of district size on the costs of operating small schools.

- Although the funds are allocated to districts using the formulas used to allocate revenues to individual schools, the block grant nature of the funding does not require that school districts use the resources at the schools that generate them. So there is no reason to expect, *a priori*, that funds generated by an individual school would be spent at that school.

While it is not clear what these findings mean in the short run, they do suggest that before undertaking a new small school adjustment in the Wyoming funding model, more research and analysis is needed. In fact, between the lack of a consistent or statistically significant pattern of differences in the characteristics of small schools in large and small districts, combined with these findings comparing revenue generation with expenditure patterns, we would recommend that no further changes to the small school adjustment be made until the model is fully recalibrated next year.

VI. Interviews with School District Leaders

While the data available for analysis does not provide a clear picture indicating further changes are needed in the small school adjustment, the lack of consistent findings or patterns in both of the analyses presented above suggests more information is needed about how large school districts with small schools operate with respect to those small schools. To better understand this issue, we conducted interviews with superintendents and in some instances business managers in the large districts in the state. The interview protocol used in those telephone interviews is included in Appendix C.

Our interviews began by confirming with the school leaders our counts of small and large schools within their districts. In general, our data were complete and accurate, although since we relied on 2002-03 data, there were a number of changes in school enrollments and even in school closures of which the interviewees made us aware.

Overall, there appeared to be two distinct types of small schools in large Wyoming districts. One type was the very small schools (enrollment between 1 and 35 to 50) and schools that were classified as small schools, but were close to the prototype threshold where they would no longer be identified as small schools.

The very small schools were all located long distances from the central office and appeared to have characteristics very similar to small schools of that size in other (smaller) districts across the state. In fact, a number of the superintendents indicated they thought operation of those schools had much more in common with the operation of similar sized schools that were located in small districts. While they described problems of access to the schools, the difficulty of providing principal support for those very small schools, and the limited access students have for social and learning activities in the rest of the district, they indicated universally that in the case of the very small remote schools the problems they faced were more like those of other small districts with small remote schools, than like the issues they faced with schools “in town” that had enrollments lower than the size thresholds.

The large school districts also had small schools with enrollments that approached the prototype thresholds. These schools were always located “in town” and in general qualified for the small school adjustment for reasons not fully under the control of the school district. In many of the districts, a number of schools have been consolidated and closed in recent years. The reasons for doing this fall into two categories:

- Meeting the school rehabilitation and modification requirements of the school facilities commission to provide adequate school facilities. In most instances the commission has required that districts build larger schools when possible.

- To enhance the education program for children by creating so called two- or three- unit schools (schools that have multiple classrooms of the same grade at the elementary level) that enhance teacher collaboration and student opportunities.

Even under these circumstances, districts with declining enrollments still have schools with enrollments below the prototype thresholds. Those that had recently closed schools were reluctant to close more at the present time, and the other districts felt that larger schools were not as educationally desirable as their current configurations. The reality is, regardless of the school size threshold used, there will probably always be a number of districts with enrollments hovering around those thresholds as the population of Wyoming cities and towns fluctuates.

In summary, small schools in large districts appear to exist either because they are located in sparsely populated remote regions of the state – despite their location in a large district; or they exist because "in town" enrollments are insufficient to meet the thresholds. In the case of the small rural schools, there is no reason to assume the cost structure of those schools differs from the cost structure of similar schools located in smaller districts. In the case of the larger schools in these large districts, the model provides a relatively small per pupil adjustment, and more research on the costs associated with enrollments at or near the prototype thresholds is needed before it is possible to say with certainty that an alternative to the current small school adjustment would more accurately reflect the "costs" of providing the educational basket required by the Wyoming Courts.

VII. CONCLUSION

The purpose of this study was to see if the cost structure of small schools located in large Wyoming school districts differed from the cost structure of small schools located in small districts across the state, and if a difference was found to recommend possible changes to the small school adjustment in the Wyoming school funding model.

To conduct this study, we first reviewed the literature on economies of scale in education. The literature suggests that there are economies of scale to be found as school size increases, at least up to some point – a point rarely if ever reached in Wyoming.

With the literature review complete, we conducted a comparison of the characteristics of small schools in small districts with those of small schools in large districts. While we did find some statistically significant differences, there was no clear pattern to those differences, and thus nothing that led us to find systematic cost based differences across districts by enrollment size.

Taking advantage of newly developed data that provided school level expenditure information, we compared the revenue generated by children at small schools with the expenditures at those schools. Since the purpose of the small school adjustment is to compensate districts for the additional costs of operating small schools, we determined that the base funding for the students in the school, plus the small school adjustment was the proper level of revenue to compare with school level expenditures. When we did so, we found most small schools generated more revenue than was expended at the school even when at risk resources and resources derived for operation of the central office were excluded from the computations.

Finally, we conducted interviews with superintendents and business managers of large school districts to develop an understanding of why small schools exist in large districts. We found that many small schools are located in remote rural areas and have characteristics very similar to small schools similarly located in small districts. On the other hand, larger small schools – those located "in town" tended to be the result of factors districts could not control precisely in the short run. None of the school leaders we talked to consciously tried to build small schools to take advantage of the adjustment available for such small schools.

As a result of our research and analysis, we recommend that the Legislature not make any further adjustments to the small school formula for the 2005-06 school year. Instead, we recommend further consideration of the small school adjustment generally, and consideration of the need for a different adjustment in large districts be part of the recalibration discussion expected to take place next year.

Appendix A

Comparison of Means Methodology

The basic methodology used throughout the analysis of characteristics of small schools in large vs. small districts report relied on the difference-of-means statistical test. The difference-of-means statistical test (t-test) compares the means of two groups, in this case, small schools in large districts versus small schools in small districts, and tests to see if the averages (means) of those two groups are statistically equal. This is known as the null hypothesis. The t-test operates under the assumptions that the two groups are independent of one another, an assumption satisfied in the case of this analysis of small schools in Wyoming.

The alternative hypothesis is that the two means are not equal to one another. We would reject the null hypothesis and accept the alternative hypothesis if the absolute value of the calculated t-statistic is greater than the t-value associated with a chosen level of confidence. In the analysis of Wyoming small schools, a confidence level of 0.10 was chosen because of the relatively small group sizes; the associated t-value, or critical value, is 1.645. A confidence level of 0.10 means that the chance of committing a Type I error, where we inadvertently reject the null hypothesis, is 10 percent.

Therefore, if a calculated t-statistic is greater than 1.645, we would reject the null hypothesis that the means of the two groups were equal and accept the alternative hypothesis that the means of the two groups were not equal with 90 percent confidence.

Appendix B

Methodology for Comparing Small School Revenues with Expenditures

Section V of this report compared school-generated revenues with school-level expenditures. The school-generated revenues are computed from two separate parts of the Wyoming Cost-Based Funding Model: the prototypical and the supplemental small-school formula allocations.

The Wyoming Cost-Based Funding Model has three primary school-level prototypes: elementary, middle, and high schools. Each school-level prototype has an assigned set of pupil-staff ratios and per-pupil non-personnel cost allocations (instructional supplies and materials, equipment, student activities, professional development, and assessment). From these predetermined pupil-staff ratios and per-pupil non-personnel cost allocations, the number of prototypical staff and amount of non-personnel costs can be derived for each school based on its school-level average daily membership (ADM). An elementary school, for instance, with ADM of 264 students generates 17.5 FTE teachers. An elementary school with ADM of 132 students generates 8.75 FTE teachers. A high school with ADM of 600 students generates 33.3 FTE teachers while a high school with ADM of 200 students generates 11.1 FTE teachers.

The supplemental funding adjustment for small schools generates the number of additional staff and amount of additional non-personnel allocations beyond the prototypical levels are required to deliver the educational basket. Therefore, at each ADM level, the small-school adjustment generates the marginal staff and non-personnel allocations.

Together, these two parts of the Wyoming Cost-Based Funding Formula generate base funding by attaching the base salaries associated to the respective prototypical staff. Though these base revenues can be linked to the characteristics of individual schools, revenues are provided to districts in the form of a block grant leaving specific resource allocation decisions to the discretion of district leadership and administration. Therefore, the school-level revenues used for the comparisons in Section V are generated by adding the prototypical personnel funding (the prototypical number of school-level staff multiplied by the respective base salaries) with the amount of prototypical non-personnel allocations and adding to them the supplemental personnel funding (the marginal number of school-level staff multiplied by the respective base salaries) and marginal non-personnel cost items.

Excluded from these school-level base revenues are any adjustments for at-risk students, teacher experience and education, classified staff experience and education, and administration experience and education, as well as any expenditures related to special education, transportation, or district-level cost items. This suggests that our estimate of the revenues generated by each school may *under*-estimate the total actually generated by that school.

These school-level base revenues were compared to actual school-level, base-salary expenditures. These school-level, base-salary expenditures were computed by taking the same base salaries associated with each staff used to compute the school-level base revenues and attaching them to the actual, non-special education-related personnel allocations reported by schools and adding the actual school-level, non-personnel expenditures. These actual school-level, non-personnel expenditures were tracked by function and object code back to each school, again, excluding special education-related expenditures.

Using the base salaries in both the revenues and expenditures and excluding the other funding adjustments associated with the Wyoming Cost-Based Funding Model facilitates comparisons between the two sides of the equation. Neither the base revenues nor base expenditures should be construed as being the actual costs or expenditures because of the multitude of additional adjustments within the funding formula that are sensitive to the actual idiosyncrasies of the school, district, and staff characteristics. Instead, the base salaries provide the starting point for any comparisons of dollars between generated resources and resource allocations.

Appendix C

Small Schools in Large Districts Study
Interview Protocol for Superintendents

District:

Superintendent:

Date and Time of Interview:

Person Conducting Interview:

Begin by explaining this is part of a study being conducted by the LSO to better understand the costs of small schools in large districts in WY.

1. How many schools are there in your district? How many of them are identified as "small schools" for the purpose of the small school funding adjustment?"

    Confirm their number with data I have.
    If there is a discrepancy, indicate my numbers are 2003-04 data.

    Also ask if some schools are smaller because they only enroll children in the primary (K-2 or K-3) grades.

2. Why does your district support schools of this size?
    a. (If necessary remind them of small school enrollment size)
    b. Probes
        i. Historical patterns
        ii. District policy for small schools (rationale?)
        iii. Educational/ instructional philosophy
        iv. Enrollment decline
        v. Geographic isolation of students
        vi. Physical capacity of schools (If they mention this ask when school was built)
        vii. Others

3. What are the benefits of small schools?

4. What disadvantages do you see from having small schools in your district?

5. As you know, the current funding distribution formula GENERATES additional funds to accommodate the additional costs associated with small schools BY SCHOOL. Does your district keep track of that small school adjustment, and do you focus the use of those funds on the small schools in your district?

   If not, how are those funds used?

6. Do you think all small schools face the same cost pressures? If not, what factors might affect costs of equally sized small schools? Do you believe that those factors increase or decrease costs?

7. Do you feel that the economy of scale issues that lead to the small school adjustment are different in larger districts, and if so can you identify what those differences might be?

8. Should the state attempt to establish a separate small school adjustment for small schools in larger districts.

9. If the small school adjustment were eliminated, how would it change the organizational structure of your district?

10. Does the ever-changing small schools adjustment (formula) make it difficult to plan?"

11. Are there any other issues that are important to a discussion of the small school adjustment?