MANAGEMENT ANALYSIS & PLANNING, INC

WYOMING EDUCATION FINANCE

Wyoming School District Employee Compensation

Submitted to

Wyoming State Legislature

Prepared for MAP by

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Introduction & Overview

In *Campbell County School District vs. State of Wyoming (Feb 23, 2001)* the Court opined that "teacher salaries, as computed by the MAP model and as driven by class size, are reasonable as supported by the record," "but, suffice it to say, if teacher salaries are not adequately adjusted for inflation in keeping with our holding on the external cost adjustment, they will no longer be constitutionally cost-based." Thus, the Court acknowledged that the compensation levels established by the 1997 school finance reforms had been adequate but that further benchmarking was required to establish current adequacy.

In response to the Court's decision it can be argued that since the current school finance system provides funds in the form of a block grant, local school districts have the ability to choose the level of compensation required to hire and retain teachers that will meet educational quality objectives. But, ultimately, whether Wyoming is able to hire and retain competent teachers will depend on how the available supply of labor responds to the compensation system in place. This is an empirical question which we explore using a variety of research strategies.

1. Teacher Compensation

Following the Wyoming Supreme Court decision, we benchmark current teacher compensation by comparing changes in Wyoming teacher pay to changes in various price and wage indices. First we examine the rate of growth of compensation for teachers at specific locations within the salary schedule. Second, we compare changes in the compensation teachers receive as they move through the salary schedule to the inflation and wage growth benchmarks.

The ability of Wyoming to attract and retain teachers will also depend on how teachers are paid elsewhere. We make this comparison by referring to American Federation of Teacher survey data that reports the state ranking of average pay for teachers, most recently for the 1999-2000 school year. The AFT data establishes Wyoming's ranking relative to all other states. But, teacher labor markets are for the most part regional. Consequently, a more accurate representation of the competitiveness of Wyoming's teacher compensation is to compare it with compensation in Colorado, Idaho, Utah, Nebraska, Montana, and South Dakota, by analyzing the published salary schedules of school districts within each state. Our comparisons are based on the latest data available - the published salary schedules for the 2000-2001 academic year. Salary schedule data allows us to compare teachers by examining compensation for identical placements within the schedule.

2. Qualifications of the Teaching Workforce

We examine the characteristics of the existing teacher staff in Wyoming by making use of teacher certification data maintained by the Wyoming Professional Teachers Standards Board.

We find that over 95% of Wyoming's teaching staff are fully certified, and that the remaining provisionally certified staff are provided various forms of support to enhance the quality of their services. Although there has been some upward drift in the numbers of provisionally certified staff, this has also been a national trend, and cannot be attributed to inadequate pay in Wyoming. Furthermore, increasing levels of provisional certification are specific to a few subject areas with no clear regional pattern.

3. Teacher Hiring for School Year 2001-02

Another indication of the competitiveness of Wyoming's compensation structure is its relative experience in hiring teachers. We examine this question by surveying all 48 Wyoming school districts, and a representative sample of 314 districts in adjoining states. The survey instrument contains both quantitative and qualitative questions regarding the hiring experiences of school districts in the 2001-02 school year and how they compare with previous years. The responses enable us to compare the most recent hiring experience of Wyoming school districts with the hiring experience of a comparable set of school districts in adjoining states.

4. Teacher Turnover

To complement our findings on labor demand we also analyze the supply side of the market. We do so by examining the choices teachers make about where they work. Two data sets inform our analysis. First, we examine the employment outcomes of the set of University of Wyoming students who graduated in 1997. This data let us analyze the differential employment experience of a cohort of students, including their choice of location and the attendant compensation received. While the class of 1997 provides us with a unique opportunity to observe the behavior of a select group of graduates in detail, we must also examine the broader teacher labor market. We do so by examining teacher turnover using state administrative records. Turnover has its reciprocal phenomenon – teachers entering the system. We combine administrative records with Unemployment Insurance wage record data to analyze the flows of teachers in and out of the Wyoming public school system.

We conclude with a summary of our research findings and develop a set of policy recommendations for revising the funding formulas for teachers, classified staff, and administrative staff.

Teacher Salaries

The Wyoming Supreme Court ruled that teacher salaries must be cost based and adequately adjusted for inflation. We present a funding formula that updates the existing formula to take into account changes in teacher compensation that have evolved since the original funding plan was put into place.

Classified Salaries

The Wyoming Supreme Court ruled that a funding system be developed to account for differences in experience, responsibility, and seniority of classified staff. Using administrative

records we develop a funding system that adjusts district funding for the composition of its classified workforce and for the experience profile of its workers.

Administrative Salaries

The Wyoming Supreme Court ruled that a funding system be developed to account for differences in experience, responsibility, and seniority of administrative staff. Using administrative records we develop a funding system that adjusts district funding for these factors.

Fringe Benefits

Employee compensation includes both salaries and fringe benefits. In this section we update the state's funding formula for employee fringe benefits.

Measures of Wyoming Teacher Pay

Growth in Wyoming Teacher Pay

The Wyoming Supreme Court specifically directed that the continued competitiveness of the Wyoming teacher pay structure be established through a comparison with rates of general price inflation and growth rates of compensation of other workers in the labor market. Chart 1 compares salary growth for four points in the teacher salary schedule from academic years 1997-98 to 2000-2001 with three measures of inflation or wage growth in the economy. The comparison benchmarks consist of the national Consumer Price Index (U.S. Bureau of Labor Statistics), the Wyoming Cost of Living Index (Wyoming Bureau of Economic Analysis), and the average change in hourly Wyoming manufacturing wages (U.S. Bureau of Labor Statistics). For this three year period, cumulative salary growth for beginning teachers with BA's or Master's degrees trailed the cumulative growth in the comparison inflation indices of the Wyoming CLI and the US CPI, as well as the average hourly manufacturing wage in Wyoming, by about 1.5 percentage points. In contrast, schedule salary cumulative increases for teachers earning at the top of the Master's degree schedule, and for those earning the schedule maximum, exceeded the inflation and wage index comparisons by 2-4 percentage points.

The comparisons of average teacher pay displayed in Chart 1 understate the actual salary increases that Wyoming's teachers enjoyed over this time period because they fail to make provision for the experience pay teachers receive as they move through the salary schedule.[1] Chart 2 rectifies this shortcoming by making provision for a three-step move through the salary schedule. Chart 2 shows that the inclusion of the three-step experience move greatly increases the growth in compensation for Wyoming teachers. The average value of a step increase in the Wyoming salary schedules was approximately $754, equivalent to 2%-3% of average annual teacher pay. When experience credit is included, the cumulative increase in salaries experienced by teachers is nearly double the increase in the cost of living increases in percentage terms. Interestingly, irrespective of whether we include the experience premium in our measure of

[1] We estimate that approximately 20% of Wyoming teachers are at the top of their pay brackets and would not receive further experience pay increments.

salary growth, Wyoming school districts provided greater proportionate rewards to more experienced teachers than it did for beginning teachers. This can be seen by the relative rates of salary growth for teachers at the schedule maximum relative to those just beginning their careers. Although not captured in this data, experienced staff pay was further enhanced by the decision of many school districts in Wyoming to increase the number of salary steps in the schedule over the time period studied. This allowed teachers who had been at their maximum step in the salary schedule to receive further experience payments. In contrast to Colorado, Idaho, Utah, Nebraska, Montana, and South Dakota, Wyoming school districts were more likely to increase the number of salary steps a teacher could be paid for, and with the exception of Colorado, increase the number of steps by a greater increment (Table 1).

Table 1: Salary Schedule Steps in Wyoming and Comparison States

State	Average # Steps AY 1997-98	Average # Steps AY 2000-01	% of Districts Increasing Steps
Colorado	20	24	39%
Idaho	13.4	13.6	17%
Montana	18.8	18.7	17%
Nebraska	15.4	15.8	18%
South Dakota	18.2	20.4	39%
Utah	20.4	20.6	25%
Wyoming	17.6	20.6	71%

Wyoming Teacher Pay Relative to Comparison States

The American Federation of Teacher's salary survey ranked Wyoming's average teacher salary 44th nationally in 1997-98.[2] This was one year after the new Wyoming funding system was established, thus giving school districts an opportunity to adjust to the new rules in place. The most recently reported AFT data (1999-2000) places Wyoming 42nd. While Wyoming ranks relatively low on national comparisons, its average pay is not out of line with surrounding states. Average teacher salaries for 1997-1998 and 1999-2000 place Colorado (23,24), Idaho (38,38), Utah (42,40) Nebraska (41,44), Montana (46,47) and South Dakota (51,51).

The simple comparison of average teacher salaries is misleading because average salary differences may reflect differences in the characteristics of the workforce. For example, higher Idaho wages may reflect an older and better-educated workforce, rather than a more generous salary schedule. A more accurate comparison would compare the wages of comparable teachers. To make this comparison we investigate the competitiveness of Wyoming teacher salaries within its reference grouping of Colorado, Idaho, Utah, Nebraska, Montana, and South Dakota.[3] By

[2] See the AFT web site for a complete listing of state salary rankings: http://www.aft.org/research/survey/tables/tableI-1.html

[3] The surrounding states comprise the most relevant labor market. Ballou and Podgursky report that more than 80 percent of newly trained teachers take jobs in the states where they attended college based on data from the Survey of Recent College Graduates (Ballou and Podgursky, Teacher Pay and Teacher Quality, Upjohn Institute for

analyzing the published salary schedules of school districts within each state this data allows us to examine teachers' pay at different points in the salary schedule.

We construct a statewide average for each cell in the schedule by weighting each school district's cell value by the FTE count or enrollment count for all school districts within a state. The states differ considerably in the number of school districts within the state, ranging from 40 districts in Idaho to over 300 in Nebraska and Montana. Wyoming, with 48 districts, reports data from all school districts in 1997-98, and all but the smallest district in 2000-2001.[4] In Nebraska and Montana not all salary schedules were reported. These missing districts account for relatively few of the teachers within the state and their exclusion has little impact on the calculation of state averages.[5] We also calculate the average value of a step increase by dividing the difference between the scheduled MA minimum and MA maximum pay, by the number of steps in that category.

The salary schedule data are collected for the 1997-98 school year and the 2000-2001 school year. This allows a comparison of the relative levels of compensation just after the Wyoming school reforms were implemented, to those paid most recently, and how those levels of compensation changed between these two time periods. To our knowledge, the detailed analysis we provide goes beyond other available salary comparisons. The AFT data are limited to either the average statewide salary for all teachers, or beginning teacher salaries. Since not all teachers are average, nor are all teachers paid a starting teacher's wage, the AFT data are limited in their ability to summarize the competitiveness of a state's compensation system. By examining multiple points in the salary schedule we hope to give a much clearer indication of how well or poorly Wyoming teachers are paid.

This methodology also allows us to ask some important questions about how different school districts altered their salary schedules. Were compensation changes over this time period focused on one part of the salary distribution or made across the board? Were compensation changes made in a way that helped ease perceived hiring and retention problems or were they directed otherwise? Our methodology also allows us to calculate the actual compensation increases enjoyed by teachers moving through the salary schedule. This provides a much more accurate picture of compensation changes than does a comparison of fixed points on the salary schedule (although the later is useful for analyzing the attractiveness of the systems to new entrants).

Chart 3 provides a look at relative teacher salaries for the 2000-01 Academic Year. We have chosen to examine five points in the salary schedule: starting teachers with either a BA or Master's degree, teachers with BA's or Master's degrees with three years experience, and teachers earning at the schedule maximum salary. Chart 3 reveals that the salary structure appears quite similar in each of the seven states. Chart 4 displays this same data in a manner that allows clearer comparisons to Wyoming. Here, each of the state's salary schedule categories is

Employment Policy, p.22, 1997). Experienced teachers are more likely to look for jobs regionally, in part, because of the limited reciprocity of licensing arrangements. This is consistent with our findings below concerning the mobility of experienced Wyoming teachers and the job placement of University of Wyoming graduates.

[4] Washakie #2 reported no FTEs at the time of the survey.

[5] See Appendix A for a further discussion of how we treated missing data in the salary schedule analysis.

calculated as a percentage of the Wyoming level. From this chart we can see that in 2000-01 Wyoming salaries exceed those of Montana and South Dakota, are higher in some categories and lower than others than those in Idaho, and clearly trail Utah, Nebraska, and most significantly, Colorado. If there is an outlier, it is Colorado, whose compensation levels are nearly 20% higher than what Wyoming districts pay.

Based on Chart 4, we conclude that Wyoming's salary structure appears competitive with states in the region. However, when school district administrators were asked to assess the competitiveness of their starting pay and their difficulties in filling vacancies, Wyoming administrators reported less competitive pay and more difficulties in hiring than their colleagues in other states (see survey results in section IV below). Chart 5 provides an objective context to these qualitative judgments by comparing the rate of pay increase for Wyoming school teachers relative to teachers in comparison states and to increases in the Consumer Price Index (also see Table 2a,b,c). As in Chart 4, we have standardized each state's situation relative to Wyoming's choices. Thus, a state that awarded the same percentage increase in teacher salaries as Wyoming, from AY 1997-8 to AY 2000-01, would be at the 100% level. More generous increases would exceed the 100% level that is pegged to Wyoming. Three conclusions stand out from this graph. First, with the exception of Montana, Wyoming has not generally kept up with the pay increases awarded in other states. Second, Wyoming has been relatively generous at the top of the salary scale but not at the entry level. Thus, the perception that hiring has become relatively more difficult in Wyoming may reflect relatively lower entry salaries in Wyoming in the 2000-01 school year as compared to 1997-98. Third, with the exception of entry teacher salaries, Wyoming teacher salary increases have kept up with cost of living changes.

More recent data suggests that Wyoming's relative position may have improved considerably. We have been able to obtain the 2001-02 salary schedules for Wyoming, although not for other states. The 2001-02 salary schedules indicate that Wyoming school districts have significantly increased teacher salaries. The **single year** increase for 2001-02 exceeds the **cumulative three year** increases (1997-2000) of 6.9% - 12.2% in virtually all categories. Unlike the earlier time period, the largest percentage increases were targeted at beginning teachers. All the increases far exceed the expected inflation rate of 3.5% for 2001-02. Although 2001-02 salary schedules are not yet available for the surrounding states, we think it unlikely that the percentage increases will match those in Wyoming. The annual increases awarded in Wyoming far exceed the average annual increases previously awarded in the other states. (Compare Table 2c to 2a.) Unless the comparison states increase their teacher salaries as aggressively as Wyoming, Wyoming will have reversed its relative decline in teacher compensation.

Table 2a: Cumulative Percent Change in Teacher Salaries (AY1997 - AY2001)

	% Change in BA Minimum	% Change in BA min + 3 steps	% Change in MA minimum	% Change in MA min + 3 steps	% Change in Maximum Salary
Montana	5.39%	18.53%	5.38%	17.07%	6.02%
Wyoming	7.40%	18.27%	6.91%	16.18%	12.22%
South Dakota	9.61%	18.18%	9.72%	17.44%	7.92%
Colorado	10.54%	21.90%	14.04%	24.62%	14.55%
Idaho	10.74%	26.72%	11.34%	25.28%	12.78%
Utah	11.18%	23.04%	10.54%	21.19%	10.90%
Nebraska	15.93%	33.21%	13.03%	27.94%	12.52%

Table 2b: Cumulative Percent Change in Consumer Price Index (1997-2001)

Consumer Price Index	7.9%

Table 2c: Percent Change in Wyoming Teacher Salaries (AY 2001 – AY 2002)

	% Change in BA minimum	% Change in BA min + 1 step	% Change in MA minimum	% Change in MA min + 1 step	% Change in Maximum salary
Wyoming	13.25%	16.9%	14.3%	17%	6.8%
Expected CPI	3.5%	3.5%	3.5%	3.5%	3.5%

Chart 1. Wyoming Teacher Salary Growth Compared with Various Indices (1997 – 2000)

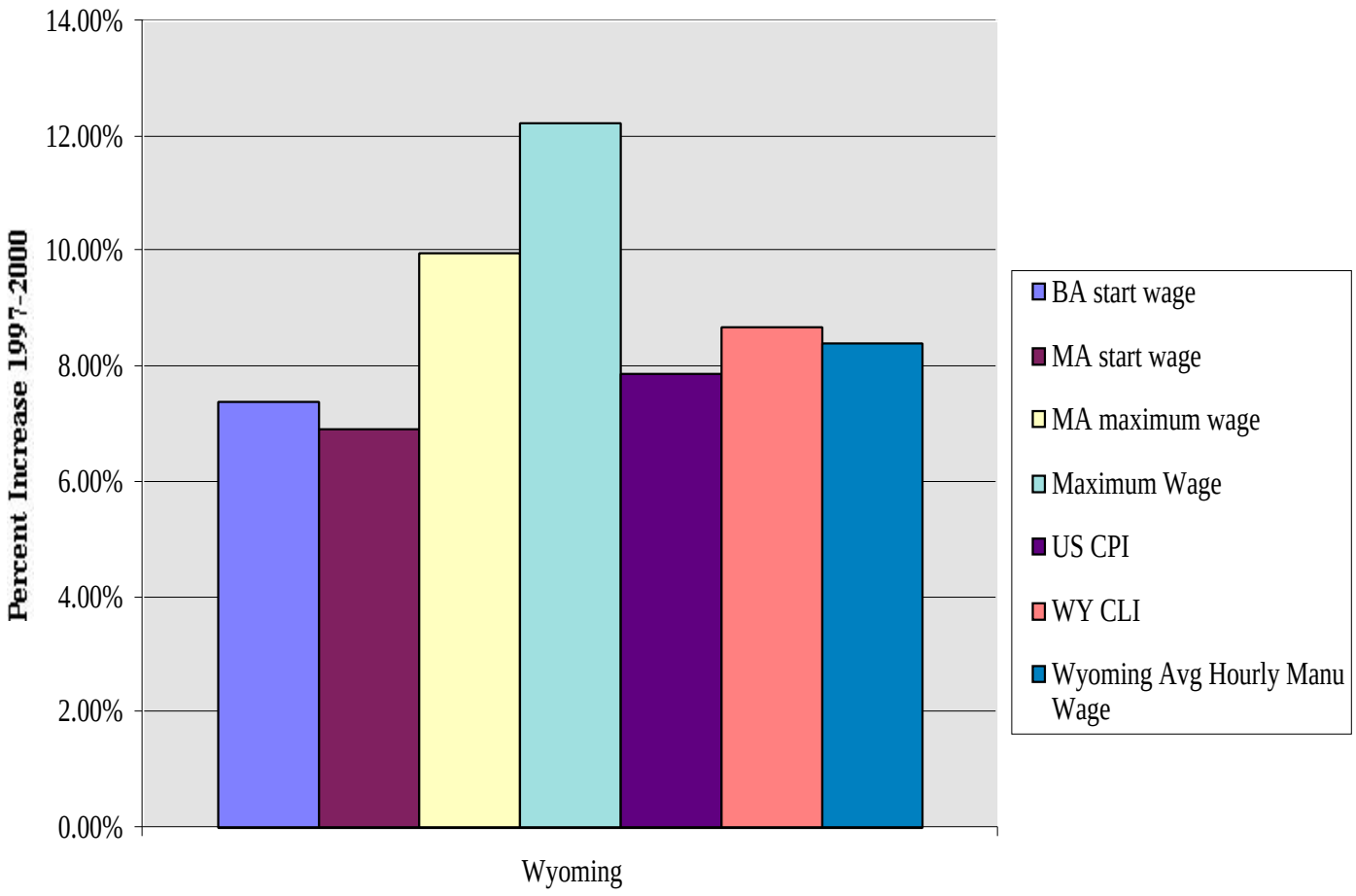


Chart 2. Wyoming Teacher Salary Growth Compared with Various Indices (1997-2000)

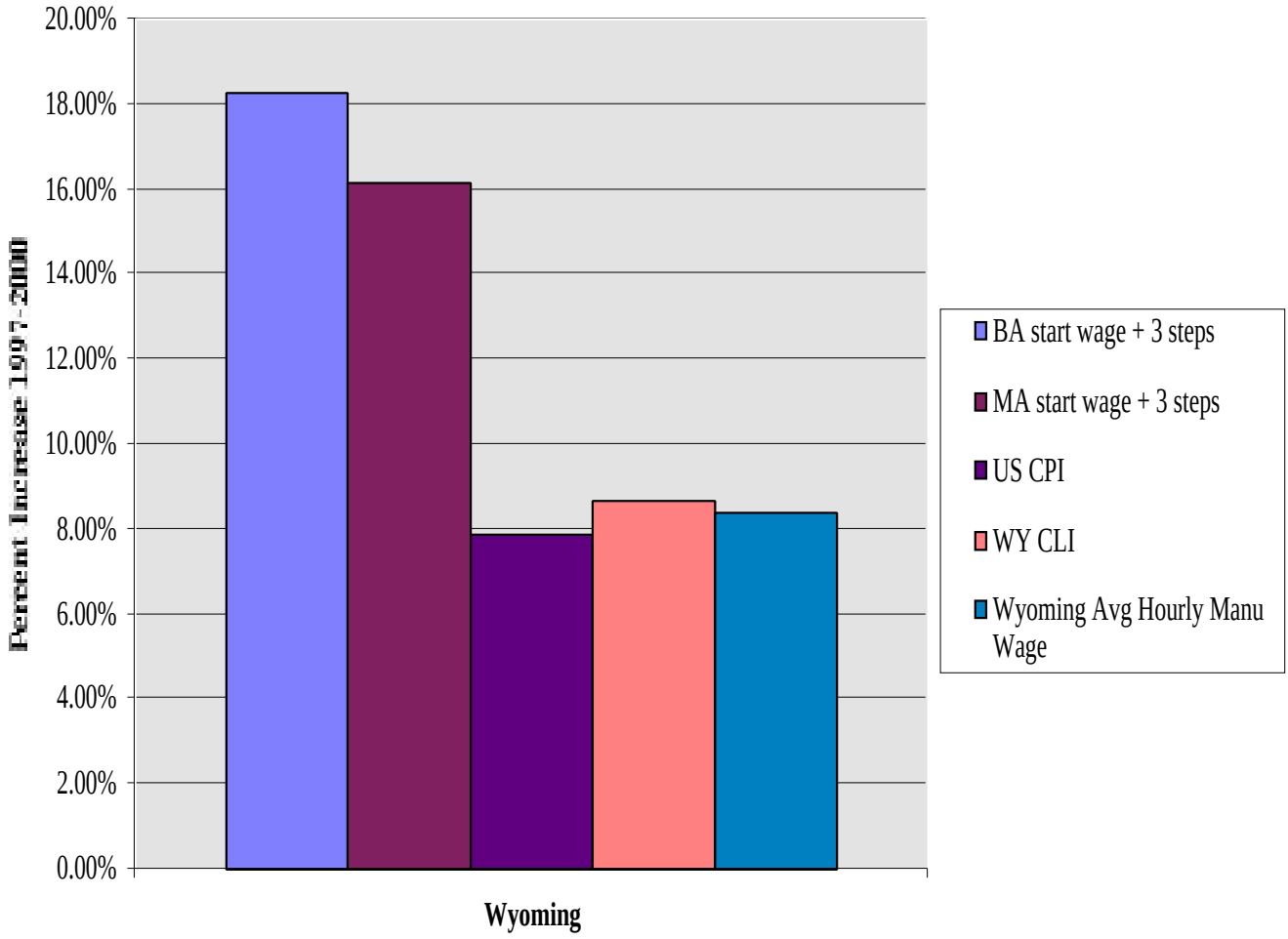


Chart 3. Teacher Salaries FY 2000

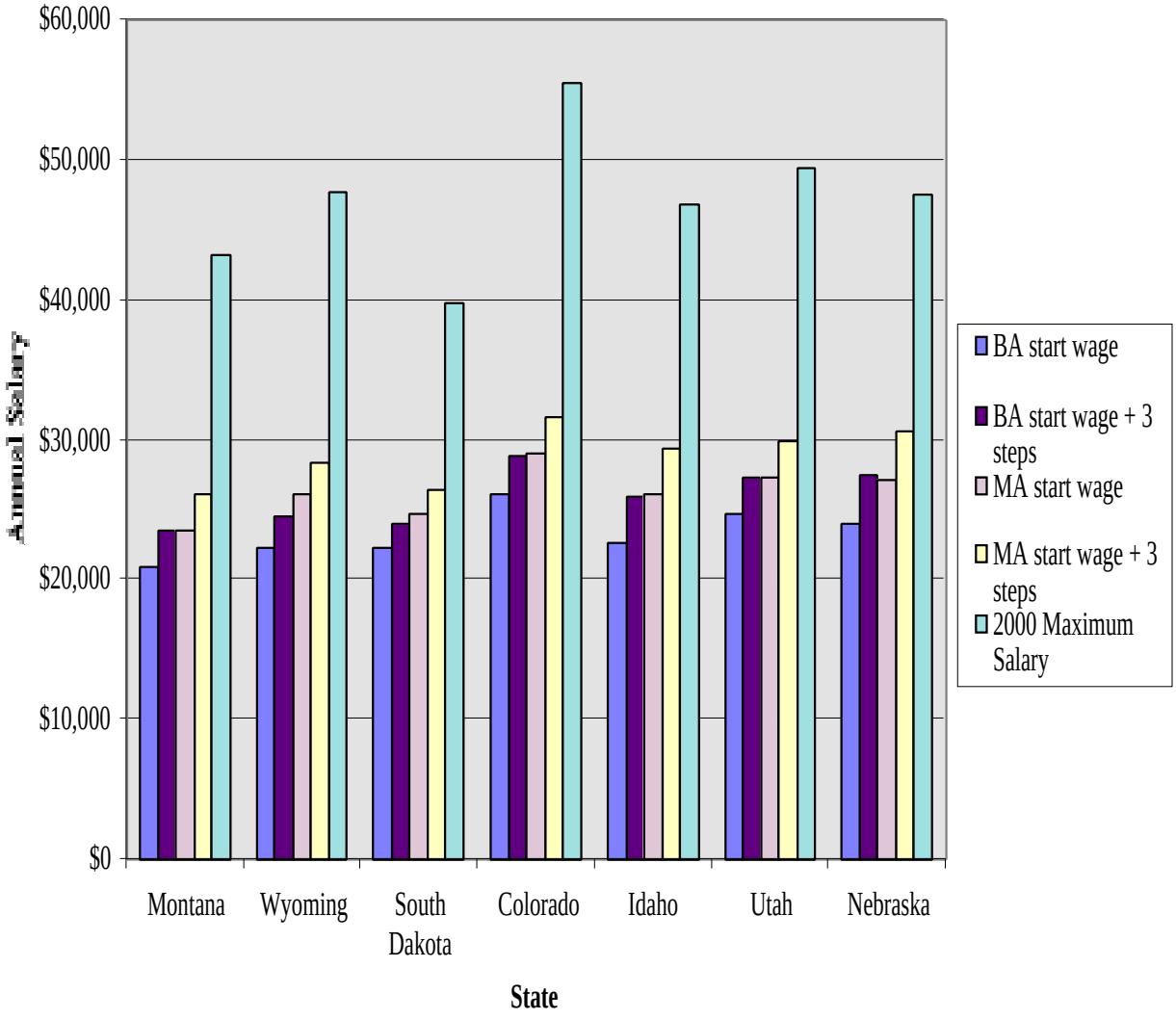


Chart 4. Teacher Salaries As % of Wyoming Salary

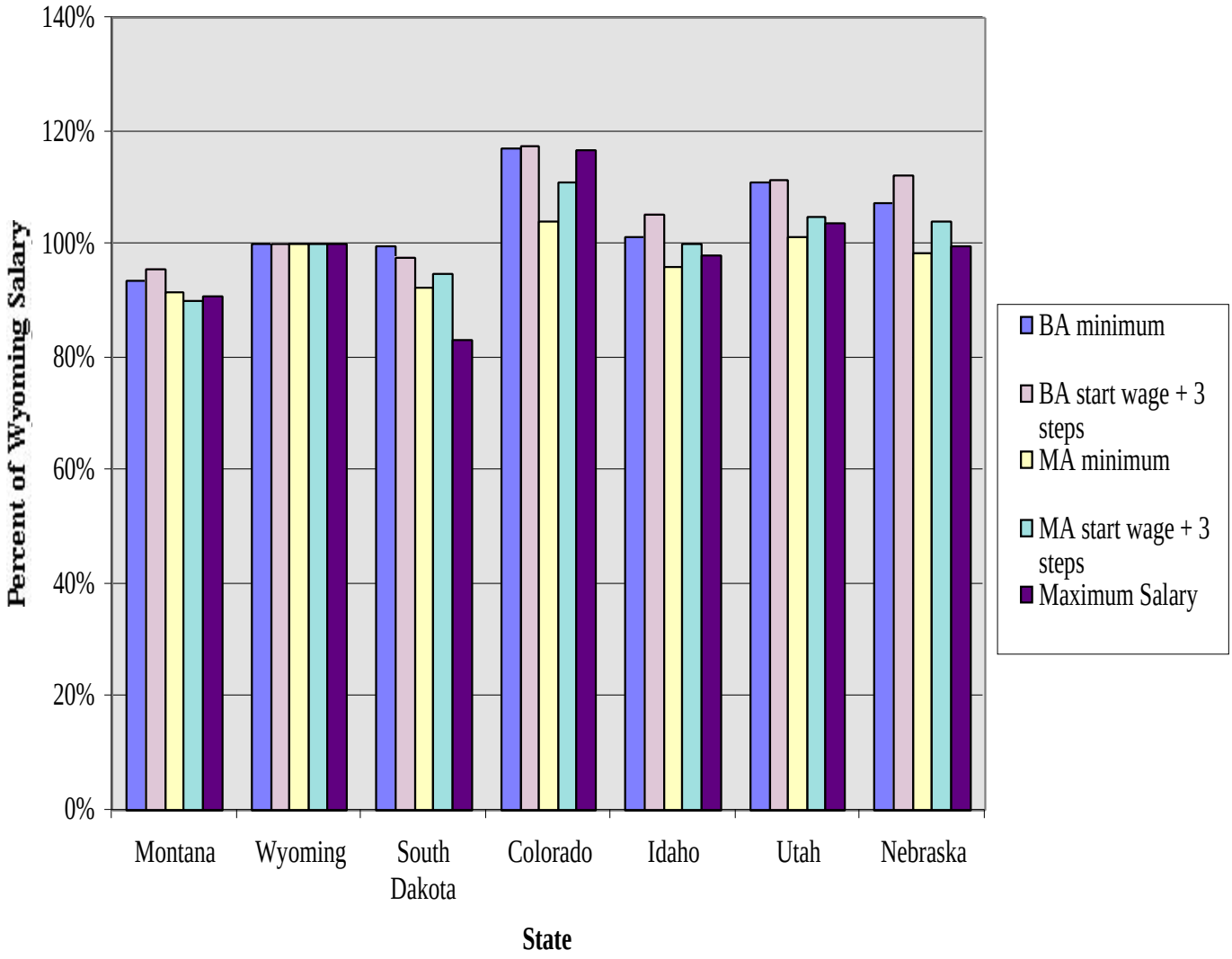
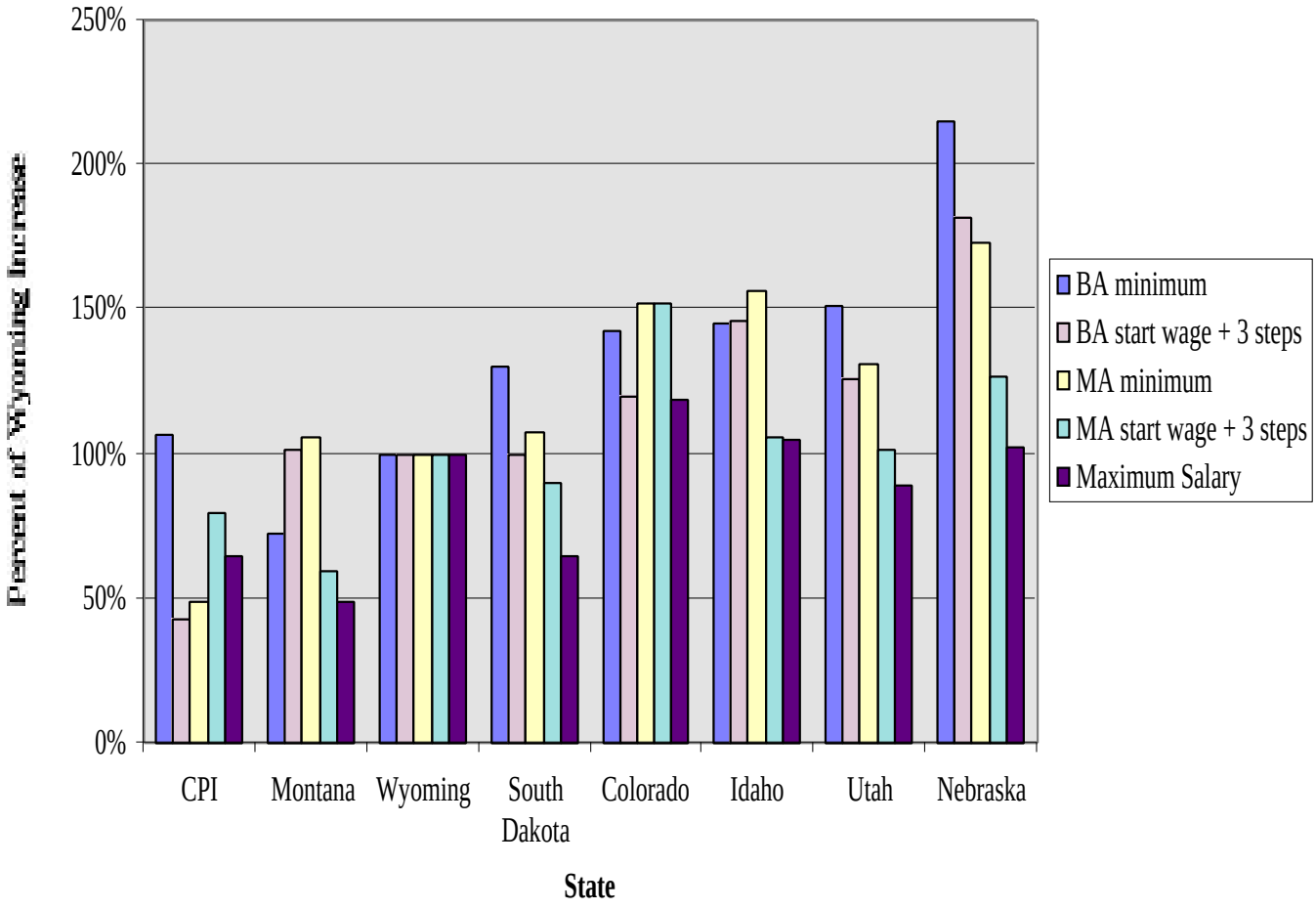


Chart 5. Teacher Salary Increases As % of Wyoming Increases



Wyoming Teacher Fringe Benefits

The competitiveness of Wyoming teacher salaries should be judged not only by salaries, but also by fringe benefits. If fringe benefits in Wyoming are below those of surrounding states, that would tend to make teaching in Wyoming relatively less attractive. Table 3 compares fringe benefits as a percent of salary for instructional staff in Wyoming with six surrounding states, using the most recent available data from the U.S. Department of Education. The average fringe benefit rate in the six surrounding states was 26.2%. This was below the rate in Wyoming (29.3%). Thus, on the basis of these data, we conclude that fringe benefits in Wyoming are competitive with those in surrounding states.

Table 3: Fringe Benefits as a Proportion of Salary Expenditures for Instructional Staff: Wyoming and Surrounding States, FY 1999

State	Instructional Staff Employee Benefits as a Percent of Salaries
UT	33.9%
NE	32.2%
WY	**29.3%**
ID	28.3%
MT	24.0%
SD	20.8%
CO	17.7%
Average Surrounding States	26.2%

Source: U.S. Department of Education, Common Core of Data. http://www.nces.ed.gov/ccd/data/zip/stfis99xls.zip

Wyoming Student-Teacher Ratios and Teacher Compensation

Whether or not recent salary increases result in Wyoming teacher salaries exceeding neighboring states, it is important to recognize that the salary levels are a choice that school districts make. School districts face a tradeoff between teacher pay and student-teacher ratios. A given increase in an instructional budget can be used to increase teacher pay, lower the student teacher ratio, or some combination of the two. Table 4 below reports data from the National Center for Education Statistics concerning student teacher ratios in Wyoming, surrounding states, and the U.S. The data in Table 4 show that school districts in Wyoming have chosen to maintain a lower student-teacher ratio than the national average or the average in surrounding states. It also illustrates that the student-teacher ratio has been falling faster in Wyoming than in the nation or the surrounding states. Resources used to reduce Wyoming's already low student teacher ratio between 1995 and the present might have been used to increase the relative pay of Wyoming teachers.

Table 4: Student-Teacher Ratios in Wyoming and Surrounding States

School Year	Wyoming	Utah	Idaho	Montana	South Dakota	Nebraska	Colorado	Surrounding States	U.S.
1993-94	15.4	24.7	19.7	16.4	14.9	14.5	18.6	18.1	17.4
1994-95	14.9	24.3	19.1	16.3	14.4	14.5	18.4	17.8	17.3
1995-96	14.8	23.8	19.0	16.4	15.0	14.5	18.5	17.9	17.3
1996-97	14.7	24.4	18.8	16.0	14.9	14.5	18.5	17.8	17.1
1997-98	14.5	22.9	18.5	15.9	15.3	14.6	18.2	17.6	16.8
1998-99	14.2	22.4	18.2	15.7	14.3	14.3	17.7	17.1	16.5
1999-00	13.3	22.0	18.0	15.2	14.0	13.9	17.4	16.7	16.1
% change 95-99	-10.1%	-7.6%	-5.3%	-7.4%	-6.7%	-4.1%	-5.9%	-6.7%	-6.9%

Sources: National Center for Education Statistics. Years 1993-94 to 1998-99, from Digest of Education Statistics 2000, Table 67. AY 1999-00 computed by author from 1999-00 Common Core of Data.

Individuals choose to become teachers and remain in the teaching workforce on the basis of both nominal pay as well as non-pecuniary factors. Class size or the student-teacher ratio are examples of the latter. Other things being equal, a school with a lower student-teacher ratio is more desirable place to work. To the extent that Wyoming school districts maintain lower student-teacher ratios than surrounding states, their competitiveness in recruiting and retaining teachers is improved and may offset differences in pay.

Teacher Certification

Teacher quality is a complex concept that cannot be measured by a single variable. Although school districts typically reward such measurable teacher attributes as education and experience, research findings have been much more ambiguous about the contribution of these factors to teacher effectiveness. Clearly, some teachers are more effective than others, but whether effective teachers can be identified prior to taking over a classroom, or on the basis of such measurable characteristics is questionable. Moreover, because of tenure rules and compensation policies teacher pay is not tied to classroom performance or measures of student achievement gain. Thus, the level of teacher pay in a district is not sufficient to summarize the quality of the teaching workforce. Nor can we necessarily expect that increased teacher pay will lead to better student performance.

Given the difficulties in measuring teacher quality, we limit our investigation of teacher quality to the proportion of teachers in a district that have regular state licenses. Wyoming teachers are required to be certified based on the standards of the Wyoming Professional Teachers Standards Board (PTSB). Certification requires the potential teacher to establish that they have received the appropriate teacher education for the position for which they are assigned. The vast majority of Wyoming teachers have such certification. We note that although Wyoming's certification requirements are similar to those in many states, research on teacher effectiveness has not established that teacher education courses are necessary to ensure quality instruction.

The PTSB has established a number of alternative certification routes for those candidates who have not acquired the credentials to be certified. Portfolio Certification allows individuals to substitute course work and work experience to meet certification standards. No further certification is required in this instance. Waivers provide an avenue to waive regulations that are not specific to statutes. In contrast, the other alternative certification categories are temporary, allowing an individual to work provisionally in a position for which they don't hold certification, during which time they complete the requirements for regular certification. Temporary permits allow individuals without certification to teach for one year and can be renewed by Board approval. Transitional certificates allow certified teachers to teach outside their subject area. Such individuals are usually in the midst of obtaining the proper subject area training to receive full certification. Collaborative certification allows teachers to teach outside of their subject area under the supervision of a mentor.

The PTSB has collected data on alternative certification assignments by school district and teaching specialty. An examination of these data reveals the degree to which the Wyoming teaching force meets the established state criteria for certification. Chart 6 displays the percentage of the Wyoming teaching workforce that holds regular certification status during the five-year period from 1996-97 through 2000-01. The vast majority of Wyoming's teachers hold the standard certification, ranging from over 97.7% in 1996-97 to over 95.5% in 2000-01. The Wyoming data compare favorably to national studies. In the 1993-94 Schools and Staffing Survey, 3.6 percent of the nation's public school teachers reported no certification in their main assignment field, and another 6.4 percent reported various types of non-regular certification (e.g., emergency, temporary, alternative), leaving 90 percent with a standard license.

While the vast majority of teachers in Wyoming are certified, there has been an upward drift in the percentage of teachers who hold provisional certification, as well as the actual number of teachers who hold such certification. Chart 7 decomposes the status of those teachers who are provisionally certified. Although the pattern is uneven, there has been an upward growth in each of the provisional categories since 1996-97.[6] This growth in provisional certification is consistent with national data. Whether this slippage reflects a generally tighter labor market or changes in the teaching market, is not answerable from these data.

Clearly, the vast majority of teachers in Wyoming are deemed qualified by the State licensing board. On average, fewer than 5 teachers in 100 are provisionally certified in Wyoming, and the 5% who hold provisional certification are required to be mentored or receive additional training to receive full certification. The average provisional certification rate is over twice as high in rural school districts (6.6%) than in non-rural districts (3.2%), although since there are only 3 non-rural districts in Wyoming (defined as mid-size town and small city in the Common Core data) a reliable statistical test of this difference is difficult. Not surprisingly, districts with higher provisional certification rates reported fewer qualified applicants applying for available positions, and a lower percentage of qualified applicants being hired in their survey responses (see section IV below). Charts 8 and 9 examine districts at both ends of the certification distribution. Chart 8 displays the percentage of districts with academic year 2000-01 provisional certification rates less than 5%, from 5-10%, and exceeding 10%. Chart 9 displays the comparable information for the average provisional certification rate over the 1996-2000 five-year period. As can be seen, the percent of districts with provisional certification rates exceeding 10% is quite small. Over the five-year period only 11 districts experienced provisional certification rates that exceeded 10% at any time, and only two districts averaged higher than 10%. Nearly 10% of Wyoming districts (5 of 48) have had certification rates that never fell below 97%. These districts account for approximately 18% of the FTE credentialed staff in the state.

Clearly, provisional certification is not a pervasive problem in most Wyoming districts. Nor, is it a problem in most academic subjects. The Wyoming PTSB maintains certification records on 35 different subject areas including elementary, mathematics, middle school, music, science, special education, etc. Teachers must be certified or provisionally certified, as described above, to instruct in these areas. An examination of the provisionally certified data reveals that provisional certification rates are not randomly distributed across all subject areas. Just as certain school districts are more likely to rely on provisionally certified personnel, some subject areas are much more likely to be staffed with provisionally certified instructors.

Chart 10 examines the prevalence of provisional certifications by subject category by graphing those specialties where more than 20 teachers held provisional certification status in 2000-01. These categories represent 45% of the provisionally certified staff in that year. By far the predominant provisionally certified category is middle school teachers, representing nearly

[6] The data contained in Chart 7 actually overstate the extent of provisional certifications for 2000-01 as they include the category of interns, which had not been included in prior compilations. If we exclude the 36 interns contained in the 2000-01 data the provisional certification rate is reduced by approximately 10% or .4 percentage points. Nevertheless, even with that adjustment, provisional certification rates have grown.

18% of the staff that held provisional certification. High levels of provisional certification among middle school teachers have been evident throughout the sample period. For each of the 5 years in the data, approximately 20% of those holding provisional certification have been in the middle school category. This is in contrast to elementary certification, in which many years all teachers hold full certification, and this past year only 1.5% of those provisionally certified were elementary teachers. In 2000-01 the specialty group with the second highest number of provisionally certified employees was the principal category. The 2000-01 numbers are misleading in that they include those principals classified as interns, a category not recorded previously to this year. Without knowing whether as many principals would have been categorized as interns in previous years, we draw attention to the large number of provisional principals in academic year 2000-01. We note further that in low enrollment districts it is common for the principal's job to be part-time and held along with the other responsibilities of a classroom teacher. Perhaps, in that case, the relatively high level of provisional certification is not surprising. Two other subject categories stand out for their level of provisional certification - mathematics and special education. Respectively, they account for from 5% to 10% of provisionally certified teachers, with their numbers growing in the last year for which we have data. National provisional certification rates are also higher for these subject areas.

The existence of relative shortages of fully certified staff in only a few selected subject areas is undoubtedly one consequence of maintaining a single salary schedule for all teachers. Labor markets typically solve the problem of skill shortages by increasing pay in areas with tight labor supply. But, with a single salary schedule, pay cannot adjust to make entry into specific subject areas more attractive. In some states hiring bonuses are offered in fields with labor shortages. Other states are experimenting with other mechanisms for increasing the supply of teachers in hard to hire subjects.

Chart 6. Trends in Certification Status

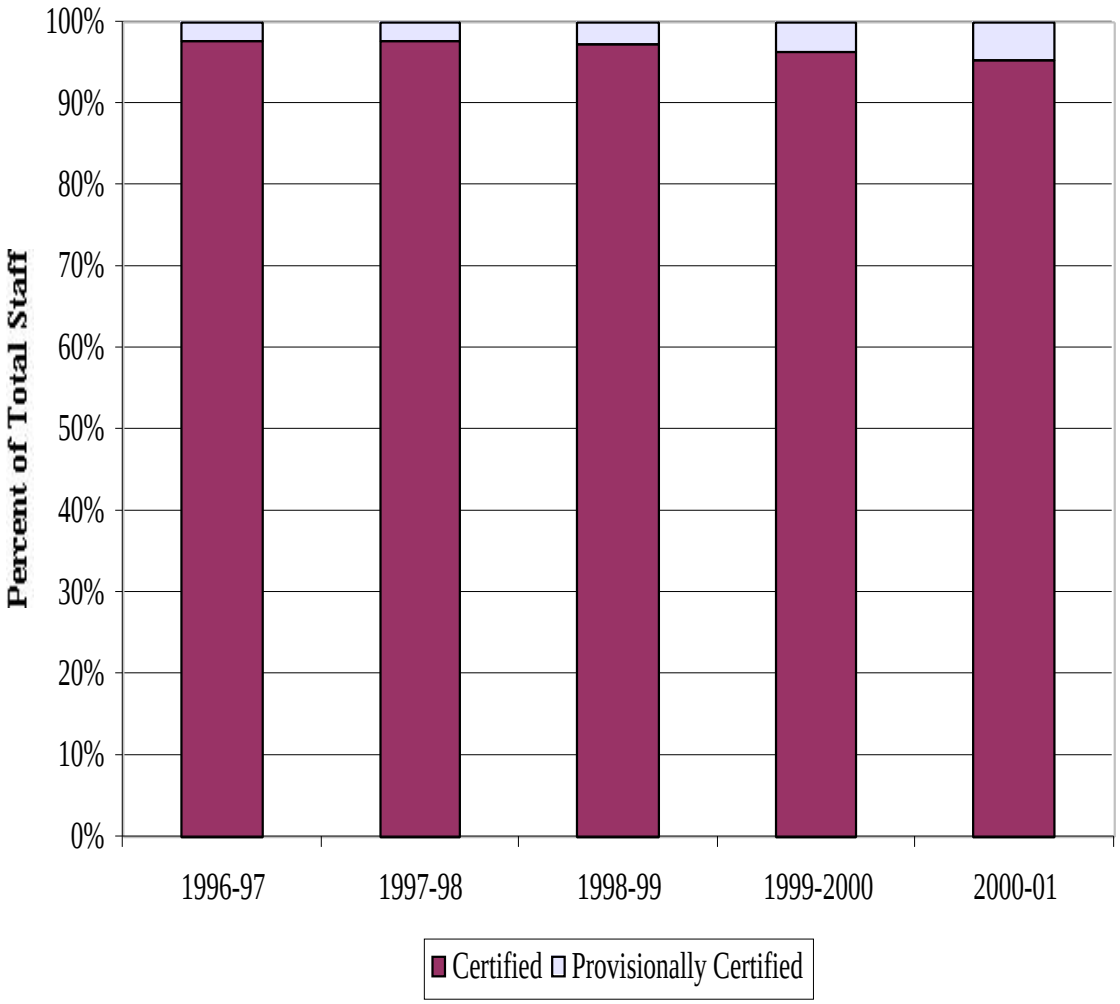


Chart 7. Trends in Provisional Certification Status

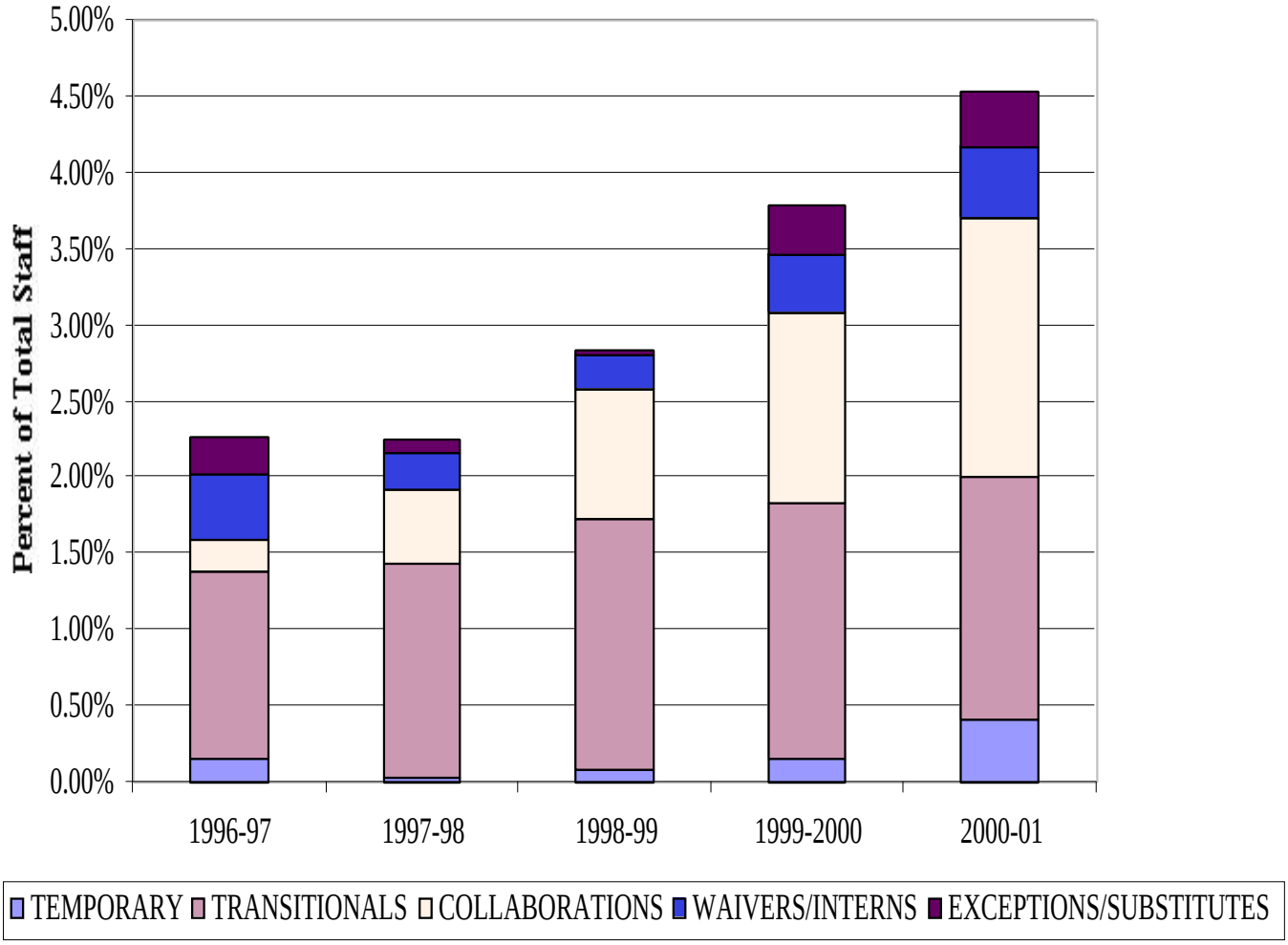


Chart 8. Provisional Certification in Wyoming School Districts (2000-2001)

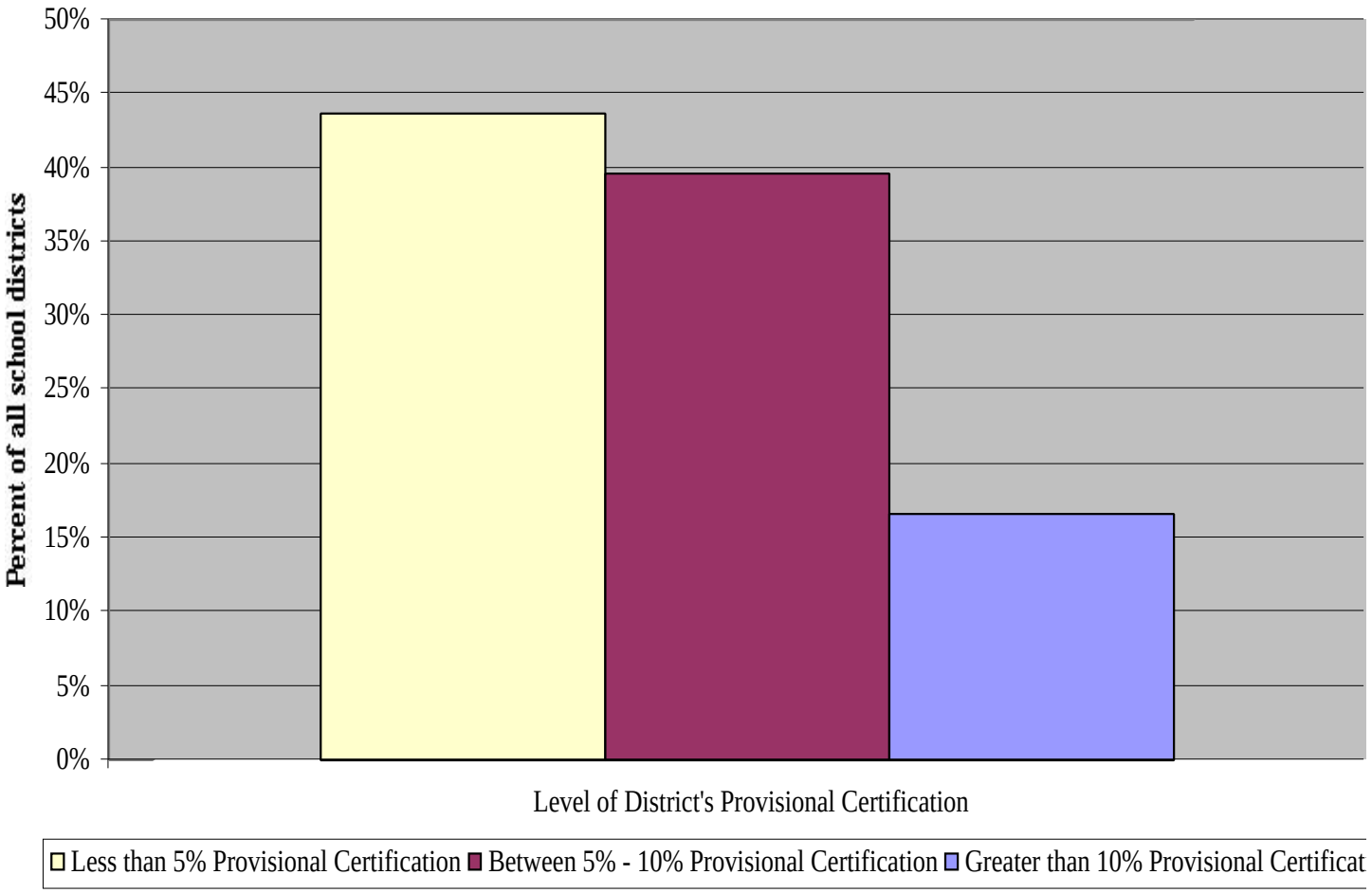


Chart 9. Average Level of Provisional Certification in Wyoming School Districts (AY 1996-97 – AY 2000-01)

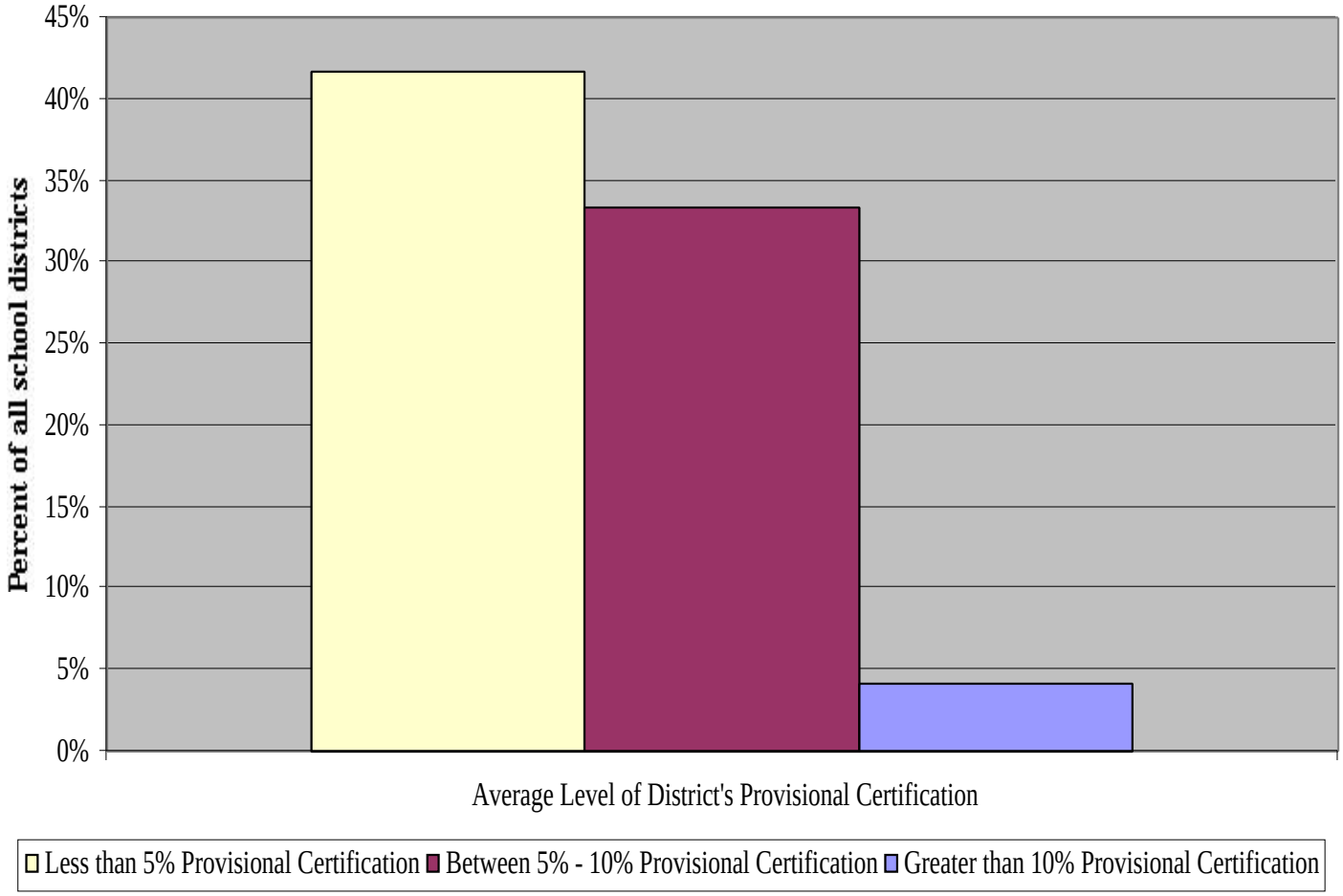
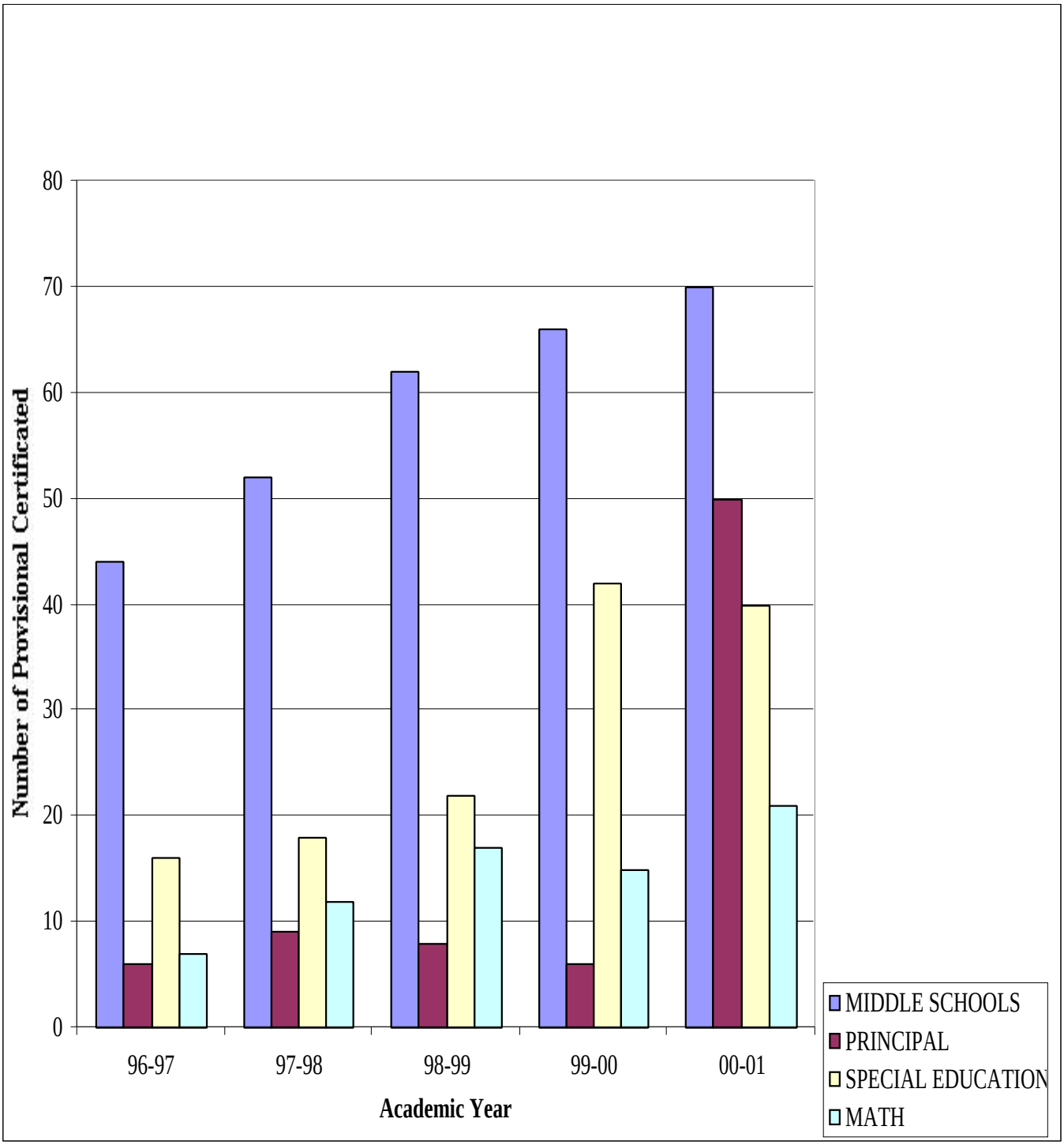


Chart 10. Subjects with >20 Provisional Certificates State-Wide (Based on AY 2000-01)



Teacher Hiring

In order to gauge the competitiveness of Wyoming teacher salaries, we surveyed district administrators in Wyoming as well as administrators in six surrounding states (plus North Dakota) concerning their experience in hiring new teachers. Specifically, we asked respondents to report their hiring experience in sixteen teaching fields broken down by school level, including the number of positions recruited, the number of qualified applicants, and the number of positions filled with qualified applicants. (The complete survey is reproduced in Appendix C.) We also asked three questions that elicited the administrator's overall assessment of the market.

We sampled districts in the comparison states so as to create a comparison group with the same population density profile as Wyoming. The U.S. Department of Education in the Common Core of Data provides a school locale code for all public schools in the U.S. There are eight classifications for this code ranging from "Large City" to "Rural" based on population density. The relevant classifications for Wyoming school districts are: Mid-Size City (cities with population less than 250,000), Large Town (city or incorporated area with at least 25,000 located outside of a large or mid-size city), Small Town (town or incorporated area with a population between 2,500 and 24,999), and Rural. For purposes of this study, we classified school districts based on the characteristics of a majority of their schools. Thus, if a majority of schools in the district were classified as rural, that was how the district was classified. We selected a random sample of 314 districts in the seven comparison states that matched the Wyoming distribution. An initial survey was mailed in June, with a follow up survey to non-respondents mailed in August. The overall survey response rate was 70 percent, which reflects a 100 percent response rate from WY districts and a 66 percent response rate from the comparison states

Table 5: Survey on Teacher Hiring: Sampling Frame and Response Rates

	WY	Comparison States
Large Town	2	10
Mid-Size City	2	14
Small Town	27	180
Rural	17	110
Total Sampled	48	314
Total Responses	48	206
Response Rate	100%	66%

The results from this survey are presented in Tables 6-8 below. Table 6 reports the number of qualified applicants per position recruited. This statistic provides an indication of the competitiveness of the pay in a district. Other things being equal, we'd expect districts with higher relative pay would have more qualified applicants per position. The number of sample observations varies by field since administrators were only asked to respond to this question if

they actually had vacancies in a field. In 12 of 16 cases the comparison states had more applicants per position than did Wyoming. However, none of these differences were statistically significant at conventional levels. On average Wyoming districts had 4.05 applicants per position as compared to 5.45 applicants in the comparison states.

Table 6. Number of Qualified Applicants Per Position Recruited
(CS = Comparison States)

Elementary	CS Mean	N	WY Mean	N	Difference	p-value	Sig.
Regular	10.8	105	6.6	33	4.2	0.127	
Special Ed	3.2	84	3.2	31	0.0	0.998	
Specialists	5.6	32	4.4	16	1.2	0.647	
Admin	10.5	39	12.7	13	-2.2	0.629	
Counselors	4.4	29	4.2	12	0.2	0.892	
Secondary							
Mathematics	4.0	73	3.3	22	0.7	0.579	
Science	4.3	67	3.7	17	0.6	0.586	
Language Arts	5.3	72	3.4	23	1.9	0.159	
Social Studies	9.3	50	7.5	18	1.7	0.536	
Foreign Lang.	3.6	24	2.5	15	1.1	0.659	
Health/PE	9.0	42	10.1	12	-1.1	0.755	
Art	3.7	15	3.6	14	0.1	0.961	
Music	2.3	63	3.6	26	-1.3	0.077	
Vocational	2.8	58	2.8	20	0.0	0.995	
Admin	10.3	54	7.6	26	2.7	0.132	
Counselors	3.0	33	4.4	17	-1.4	0.229	

Table 7 reports results for the proportion of positions filled by qualified applicants. Once again, other things being equal, we'd expect that districts with higher pay should have more of their positions filled by qualified applicants. In 14 of 16 cases, the ratio was higher in the surrounding states, and in three of these cases the difference was statistically significant. Pooling all positions, we find that the proportion of positions filled with qualified applicants was .708 in Wyoming and .793 in the comparison states. For Wyoming this amounted to 230 positions that were not filled with qualified applicants as of the time of the survey in August 2001. While the vacancy rate is higher in Wyoming than the comparison states, these unfilled positions represent a fairly small percentage of the overall Wyoming teaching workforce of roughly 7,600 teachers.

Table 7. Proportion of Positions Filled By Qualified Applicants
(CS = Comparison States)

Elementary	CS Mean	N	WY Mean	N	difference	p-value	Sig.
Regular	0.966	106	0.925	33	0.041	0.130	
Special Ed	0.804	83	0.731	29	0.073	0.332	
Specialists	0.823	31	0.745	16	0.071	0.536	
Admin	0.951	41	0.897	13	0.054	0.476	
Counselors	0.800	30	0.818	11	-0.018	0.921	
Secondary							
Mathematics	0.825	71	0.697	22	0.128	0.240	
Science	0.896	67	0.786	17	0.128	0.127	
Language Arts	0.935	69	0.705	21	0.230	0.005	*
Social Studies	0.910	50	0.719	19	0.191	0.038	*
Foreign Lang.	0.761	23	0.533	15	0.228	0.135	
Health/PE	0.850	40	0.786	10	0.064	0.628	
Art	0.906	16	0.690	14	0.216	0.100	
Music	0.712	59	0.613	25	0.099	0.365	
Vocational	0.769	56	0.549	19	0.220	0.049	*
Admin	0.866	51	0.917	26	-0.051	0.472	
Counselors	0.843	35	0.813	16	0.030	0.831	

Finally, Table 8 reports the results of a general assessment of pay and competitiveness by the superintendents. Superintendents were asked the following three questions:

> "The compensation we offer *starting* teachers is usually adequate to compete with other districts to hire staff."
>
> "The compensation we offer *experienced* teachers is usually adequate to compete with other districts to hire and retain staff."
>
> "We now find it more *difficult* to hire teachers than we did 5 years ago."

In each case, we asked the administrator to choose one of four Likert-scaled responses: Strongly Agree, Agree, Disagree, Strongly Disagree. In Table 8 we report the sample mean for these items, where responses were coded strongly disagree = 1 up to strongly agree = 4. Thus larger values indicate stronger agreement. Wyoming administrators were less likely to agree that starting and experienced pay was competitive, and they were more likely to agree that it was more difficult to hire teachers than five years ago. In all these cases, the differences were statistically significant.

Table 8. Administrator's Assessment of Competitiveness of Pay and Market Conditions
(CS = Comparison States)

	CS Mean	N	WY Mean	N	difference	p-value	Sig.
Starting Compensation is Competitive	2.51	203	3.19	48	-0.68	0.000	*
Experienced Compensation is Competitive	2.44	202	3.04	48	-0.60	0.000	*
More Difficult To Hire Than Five Years Ago	1.59	201	1.29	48	0.30	0.033	*

Although our comparison sample was designed to match the population density distribution in Wyoming, it is possible that for any particular field, we were not comparing the same types of districts. For example, the Wyoming districts hiring music teachers may be disproportionately rural whereas those hiring teachers in the comparison states might be large towns. In order to explore this issue, we limited our comparisons to districts in counties classified as completely rural and or containing small towns only. While this sharply reduces the Wyoming and comparison state samples, the same general pattern of results holds. For the teaching field variables, almost all differences are positive. However, with the much smaller sample size, none of the differences are statistically significant. For the overall questions in Table 8, the results remain the same, with all of the differences favoring the comparison states, and all remaining statistically significant. It is interesting to note that on the last question, all 17 of the Wyoming rural and small town districts strongly agreed (value = 1) with the statement that it was harder to hire teachers, whereas just 64 percent of rural and small town district superintendents in the comparison states strongly agreed.

Finally, it should be noted that this survey was mailed out with a cover letter from the Wyoming Superintendent of Public Instruction encouraging cooperation in the study. It is possible that this type of official signal influenced the way in which the Wyoming superintendents responded, as compared to superintendents in the comparison states. This is particularly the case if Wyoming respondents felt that there were potential financial benefits from stressing the difficulties in hiring qualified teachers.

Labor Market Outcomes of the 1997 University of Wyoming Graduating Class

An analysis of the labor market experience of college graduates provides further evidence of the competitiveness of teacher compensation in Wyoming. To conduct this analysis we utilize a data set consisting of basic academic records for the 1997 graduating class from the University of Wyoming linked to Unemployment Insurance wage record files, maintained by the Wyoming Department of Labor. These files allow us to track labor market outcomes for these graduates in Wyoming and, through a reciprocity agreement, Colorado, Utah and South Dakota.

Confidentiality requirements restrict the level of detail we can extract for each individual, but the aggregate data are rich enough to provide a number of insights.

In 1997, 1553 students graduated from the University of Wyoming with bachelor's degrees. Our data set consists of those graduates whose social security numbers appear in the Unemployment Insurance wage record files in subsequent time periods. Since only 50% of the graduates have earnings covered by the Unemployment Insurance system in Wyoming, Colorado, Utah or South Dakota, our analysis does have some limitations. However, the comparison between labor market outcomes in Wyoming and the other 3 states speaks directly to the competitiveness of teacher pay in Wyoming.

Although individuals who appear in the data may differ from those who do not (they work in covered employment in these states as opposed to not working or working in other states), we don't believe they differ in ways that would bias our comparison between the labor market in Wyoming and the labor market in the three comparison states. For example, 16% of the graduating class majored in education, a proportion only slightly different from the 18% of the covered employment sample, indicating that at least in this important dimension, the covered sample looks quite similar to the universe of all 1997 University of Wyoming graduates.

The University of Wyoming data provide basic information on the academic program, performance, and state of origin of the 1997 graduates, while the labor market data provide us with earnings' outcomes subsequent to graduation. Not surprisingly, education majors are much more likely to work in public elementary or secondary schools than are non-majors. 70% of the education majors appearing in our sample have predominant earnings as teachers as opposed to only 6% of non-education majors. Similarly, University of Wyoming graduates whose residency before college was in Wyoming were much more likely to work in Wyoming than were those graduates whose prior residency was out-of-state (approximately 70% vs. 45%, depending on the year measured). Over time, education majors were also somewhat more likely to remain working in Wyoming than were non-education majors. On average, those who worked in Wyoming had higher undergraduate grade point averages than those who worked in other states. We view these results as an indication of the ability of Wyoming's schools to attract and retain educated workers in its labor force.

The decision of University of Wyoming graduates to work in Wyoming is one indication that the Wyoming labor market is competitive. The actual earnings records of those in the sample provide further evidence of the relative attractiveness of Wyoming employment. We examine this issue in two ways. First, we compare average earnings across states for those who worked as public school elementary or secondary teachers. Second, we compare public school teacher to non-teacher earnings in Wyoming and other states for the same time period. We make these comparisons using annual earnings tied to the academic year calendar (July1 – June30), in each year subsequent to graduation (academic year 2000-01 earnings are not yet available).

Tables 9a-c contain our results. The tables display results for those whose only earnings were from teaching (panel a), those who had no teacher earnings (panel c), and those who worked both as teachers and in other industries (panel b). Earnings for 1997 are appreciably lower than later years as is to be expected for the 1997 graduating class. Wyoming teacher

compensation looks quite competitive based on the annual data that shows Wyoming salaries exceeding Utah and South Dakota in 1998 and 1999, but trailing Colorado only in 1998. Of course, small sample sizes for the comparison states (fewer than 10 teachers appear in the data for Utah and South Dakota) create some interpretation problems, but the general pattern in this data is similar to the salary schedule data that we report on elsewhere in this report. The second panel (b) displays average earnings of teachers who also had other employment, consisting of those teachers who hold a second job after school or during the summer, and possibly some individuals who switched from one job to another during the quarter. Here we find that the total earnings of Wyoming teachers who hold other jobs exceed dual job holding teachers in the comparison states. Whether this indicates a better secondary job market in Wyoming or some other factor is not discernable from this data. But for those teachers who are willing to work in the summer, or after school, as many do, Wyoming appears to offer opportunities for greater total compensation.

Panels a and b generally indicate that 1997 graduates of the University of Wyoming earn less as teachers in Wyoming than in Colorado but more than the other comparison states. As a further point of comparison we also provide data on non-teacher compensation, allowing us to examine the relative competitiveness of teacher compensation within a state. Panel c shows clearly that graduates working outside of teaching earn more than those teaching in every state. This is consistent with national data indicating that teacher salaries are lower than salaries in other professions (although as is often pointed out, some of this discrepancy is due to the shorter work year). These data can be further analyzed to compare teacher to non-teaching earnings in each of the states. We find that the ratio of Wyoming teacher salaries to Wyoming non-teaching salaries for University of Wyoming graduates is much higher than it is for the comparable ratio in other states. For example, Wyoming teachers earned 98% of non-teaching annual earnings in 1999, while the corresponding ratio in the comparison states was only 77%. Clearly, Wyoming teachers are better paid relative to workers within their own state than our comparison state teachers.

Table 9. Employment Outcomes for 1997 University of Wyoming Graduating Class

Table 9a: Average school year earnings for work in 8211* only

	1997		1998		1999	
	N	Av. Earnings	N	Av. Earnings	N	Av. Earnings
WY	74	15,212.43	95	19,677.93	109	21,327.00
CO	20	15,988.05	26	19,259.12	28	22,066.04
SD/UT			9	11,727.97	6	19,178.99
MOU**	20	15,988.05	35	17,322.53	34	21,556.56
Total	94	15,377.46	130	19,043.78	143	21,381.58

Table 9b: Average school year earnings for those with some 8211* earnings

	1997		1998		1999	
	N	Av. Earnings	N	Av. Earnings	N	Av. Earnings
WY	74	16,721.85	95	21,049.98	109	26,699.52
CO	20	18,451.80	26	22,034.58	28	25,461.71
SD/UT			9	14,308.61	6	21,097.49
MOU**	20	18,451.80	35	20,047.90	34	24,691.56
Total	94	17,089.93	130	20,780.19	143	26,222.10

Table 9c: Average school year earnings for those with NO 8211* earnings

	1997		1998		1999	
	N	Av. Earnings	N	Av. Earnings	N	Av. Earnings
WY	762	11,826.89	594	22,493.97	514	21,858.77
CO	164	16,114.82	178	23,182.62	206	27,682.25
SD/UT			31	24,236.88	40	29,601.15
MOU**	164	16,114.82	209	23,339.00	246	27,994.26
Total	926	12,586.31	803	22,713.91	760	23,844.73

Source: Wyoming Department of Employment, Research and Planning, tabulation made for author, 9/25/01.

8211* is Standard Industrial Classification for public, elementary and secondary schools.
Sample is restricted to those with greater than $5,000 in annual SIC 8211earnings in tables 9a and 9b.
SD/UT are South Dakota and Utah
MOU** is Memorandum of Understanding State (Colorado, South Dakota, Utah)
Blank cells indicate too few cases to display due to confidentiality requirements.

Teacher Turnover

Empirical studies of teacher turnover consistently show a negative relationship between the turnover rate of teachers and relative pay: higher relative pay lowers the teacher turnover rate. Thus the level and trend in teacher turnover may shed light on the adequacy of teacher pay. If the turnover rate is rising this may indicate a decline in teacher pay relative to non-teaching alternative occupations. Rising teacher turnover may also signal difficulties in the ability of schools to staff classrooms. Very large and persistent differences between districts may also suggest inadequate pay.

A recent report on teacher attrition prepared by the Wyoming Department of Education sheds some light on this issue. Before examining these data it is important to recognize that the turnover we are analyzing does not necessarily represent permanent separations from teaching. It is well known that many teachers leave the workforce temporarily, most commonly after the birth of a child, and return at a later date. Thus, some of the teachers whom we count as "turned over" in the tabulations below will return to the workforce in a year or two. It would be possible to use a narrower definition of turnover and define it as an exit from the workforce for, say, three or more years. However, since our purpose is to see if there is a break in the turnover trend since the mid 1990's, adopting such a definition would terminate our time series prematurely. Moreover, whether separations are permanent or not, teachers who leave the workforce must be replaced if the size of the workforce is to remain unchanged.

With these caveats in mind, we examine trends in teacher turnover. Table 10 is reproduced from a recent WDE report. First, we note that the overall turnover rate has increased from 7.1 percent in the 1994-95 school year to 10.8 percent in the 1999-2000 year. The WDE report notes that some of this overall increase can be attributed to an aging workforce. Over the period from 1994 to 1999 the average age of a Wyoming teacher increased from 42.3 to 43.5 years. However, it should also be noted that the turnover rate increased within every age group. This is particularly the case for age groups under age 50, which account for the bulk of the teaching workforce.

Table 10: Teacher Turnover Rates in Wyoming: 1994-95 to 1999-2000

Age Group/Year	1994	1995	1996	1997	1998	1999
<25	15%	21%	22%	26%	22%	23%
26-30	13%	13%	16%	15%	18%	17%
31-35	8%	8%	11%	11%	11%	12%
36-40	6%	6%	6%	6%	7%	8%
41-45	4%	6%	5%	5%	5%	7%
46-50	4%	5%	5%	5%	6%	6%
51-55	5%	9%	8%	7%	8%	10%
56-60	16%	16%	17%	19%	17%	20%
61-65	34%	42%	38%	42%	38%	38%
66-70	50%	63%	20%	14%	25%	20%
Total	7.1%	8.3%	8.9%	8.7%	9.5%	10.8%

Source: Holloway (2001), Table 1. Year refers to school year (e.g., 1994 = 1994-95)

Table 11 presents turnover data for urban and rural districts. Both rural and more urbanized districts experienced increases in teacher turnover between 1994 and 1999. The largest proportional increase in turnover was in small town districts, followed by city/large town, and rural. By 1999, the turnover rates in the three locales had largely converged, with relatively minor differences remaining.

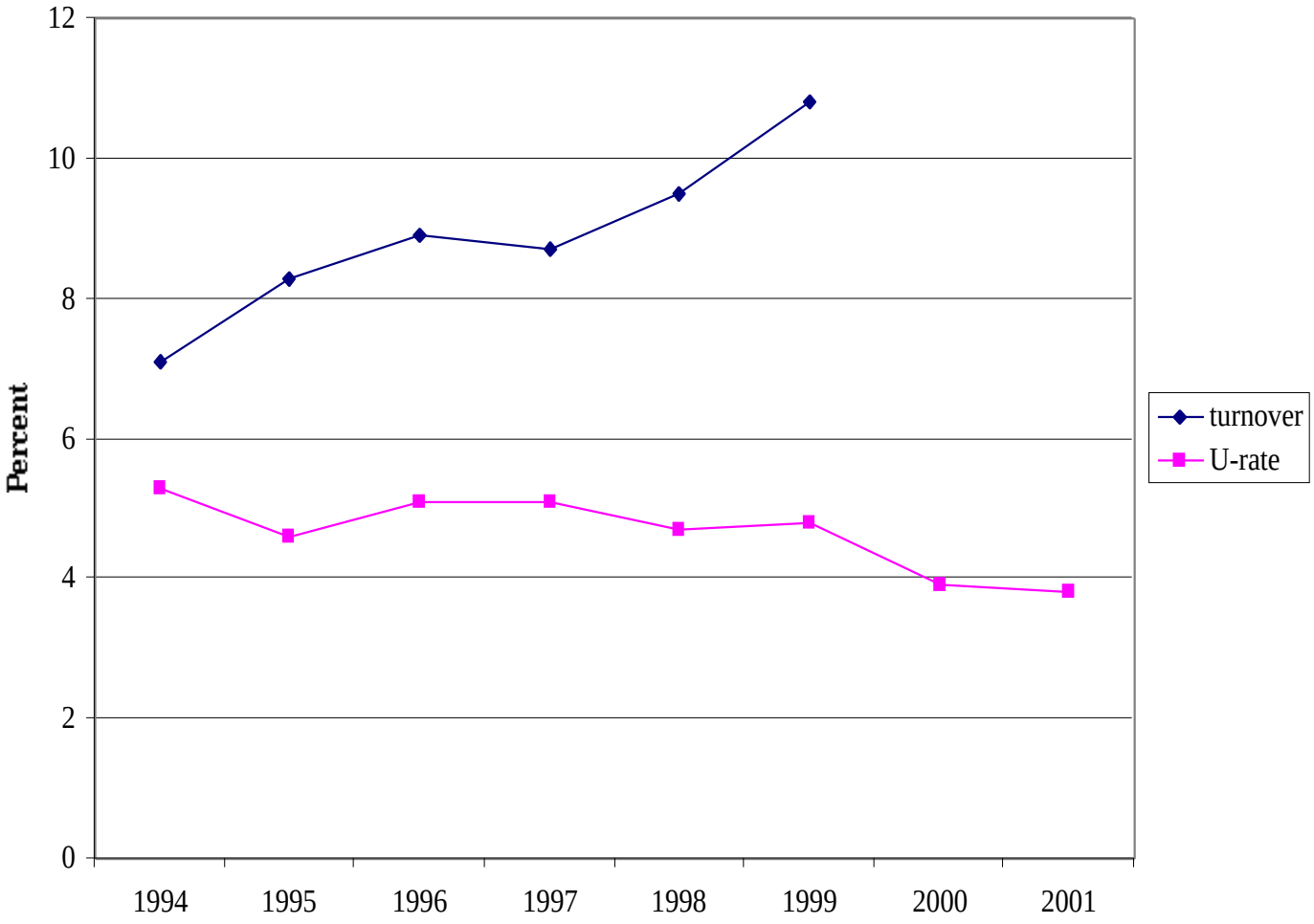
Table 11: Teacher Turnover Rates by Locale

Year	City/Large Town	Small Town	Rural
1994	7.5%	7.1%	9.3%
1995	6.6%	7.8%	11.0%
1996	7.5%	8.8%	10.6%
1997	7.8%	7.9%	11.3%
1998	8.2%	8.9%	12.2%
1999	9.9%	10.9%	11.5%

Source: Holloway (2001), Table 4. Year refers to school year (e.g., 1994 = 1994-95)

These turnover trends suggest that teacher pay may have become less competitive relative to pay in other sectors. However, it should also be noted that teacher turnover, like labor turnover in other industries, is sensitive to macroeconomic conditions. This is illustrated in Chart 11 where we report aggregate teacher turnover in Wyoming and the Wyoming unemployment rate. Rising teacher turnover in Wyoming generally coincides with a falling statewide unemployment rate. As alternative employment opportunities expand, quit rates in many sectors of the economy rise. Teaching is no exception. However, the unemployment rate, both nationally and in Wyoming, is now rising. Other things being equal, this is likely to lower the teacher turnover rate in coming years.

Chart 11. Wyoming Teacher Turnover and Unemployment Rate



Sources: Holloway(2001), Bureau of Labor Statistics web site, seasonally-adjusted July unemployment rate

Teacher Migration

If teacher salaries in Wyoming were uncompetitive, we would expect to observe a substantial net exit of teachers from Wyoming to higher paying teaching jobs in other states. We are able to track teacher migration from three surrounding states with the assistance of the Wyoming Department of Employment (WDE). WDE was able to follow teachers who entered or left teaching positions in Wyoming (identified using Wyoming Department of Education administrative records) and three surrounding states (Colorado, South Dakota, and Utah) using Unemployment Insurance earnings records.

Table 12 below reports the results for the exiting teachers. Between 1992-93 and 1999-2000, 139 teachers aged 59 or younger left a teaching job in Wyoming and were reemployed as a teacher in one of these three surrounding states. The annual outflow of teachers is small, ranging from a high of 37 (1999) to a low of seven (1994).[7] In every case, the reemployment earnings of the teachers were lower than their prior teaching earnings in Wyoming.

Table 12. Wyoming Teachers Migrating to Teaching Jobs in Colorado, South Dakota, and Utah

Year of Exit	Number of Migrating Teachers	Teaching Salary in Wyoming	Teaching Salary in New State One Year Later
1993	23	$25,594	$20,279
1994	7	$26,180	$20,484
1995	10	$27,533	$23,158
1996	10	$27,743	$20,317
1997	33	$26,119	$20,254
1998	19	$31,152	$26,888
1999	37	$31,025	$27,051

Due to confidentiality restrictions, the Department of Employment was not able to report the reemployment earnings broken out for each state. However, Table 13 reports the numbers of reemployed teachers and reemployment earnings for Colorado and South Dakota/Utah combined for the most recent data year. The most important destination state was Colorado, which accounted for 24 exiting teachers in 1999. However, reemployment earnings in Colorado were still below those in Wyoming. A similar pattern was observed in earlier years as well.

[7] Year of exit 2000 is not reported in Table 12 because wage data is not yet available for 2001.

Table 13. Wyoming Teachers Migrating to Teaching Jobs in Colorado, South Dakota, and Utah in 1999

New State of Teaching Employment	Number of Migrating Teachers	Teaching Salary in Wyoming	Teaching Salary in New State
Colorado	24	$30,632	$27,003
South Dakota/ Utah	13	$31,752	$27,139

The data presented thus far are for teacher exits only. However, there is also migration of teachers in the other direction as well, i.e., migration of teachers from Colorado, South Dakota, and Utah to Wyoming. In order to estimate that flow, we created a file of new teachers who entered Wyoming public school classrooms over the period 1991-92 to 2000-2001. The WDE then determined the sector of employment one year earlier in the three surrounding states. During the 1991-92 to 2000-2001 time period, 131 teachers left public school jobs in these surrounding states and became public school teachers in Wyoming. This compares with 139 teachers who left Wyoming schools between 1991-92 and 1999-2000 to become teachers in these surrounding states. Thus, the outflow of teachers from Wyoming to these surrounding states is approximately equal to the inflow to Wyoming since the early 1990's.

Conclusions

In this report we have attempted to assess whether Wyoming's compensation is adequate to recruit and retain a qualified education workforce. The following summarizes our main findings:

- The pay of experienced teachers in Wyoming remains competitive with the pay of teachers in adjoining states and with non-teaching occupations. However, the pay of beginning teachers in Wyoming has declined relative to teachers in other states and non-teaching occupations.

- Since 1997 Wyoming school districts have tended to "backload" pay increases by providing larger increases for experienced as compared to new teachers.

- The earnings of experienced Wyoming teachers grew faster than the national or Wyoming rate of inflation, and Wyoming manufacturing earnings between 1997 and the present.

- Wage increases for starting teachers grew slower than the rate of inflation or Wyoming manufacturing earnings between 1997 and the present.

- The 2001-2002 pay increases for Wyoming teachers are higher for beginning than for experienced teachers and are larger than those in Wyoming or in the adjoining states since 1997.

- Wyoming school districts have lower student-teacher ratios than adjoining states. In addition, the student-teacher ratio in Wyoming is declining faster than in surrounding states. If Wyoming school districts maintained a student-teacher ratio similar to that in adjoining states, it would be possible to raise teacher pay by 26 percent

- The average effective fringe benefit rate for Wyoming teachers is higher than the average effective fringe benefit rate in comparison states.

- In spite of lagging beginning teacher salaries, Wyoming school districts were usually able to fill vacant positions with qualified teachers.

- Wyoming school districts reported an average of 4.1 qualified applicants per vacant position. This level is not significantly different from that in surrounding states.

- Ninety-six percent of the Wyoming teaching workforce has regular certification in their primary teaching field, a rate higher than the national average. Provisionally certified staff tended to be concentrated in a small number of teaching fields that are experiencing shortages in many states.

- Very few University of Wyoming graduates take jobs as teachers in surrounding states. Of those that do take jobs in surrounding states, pay is very similar to that in Wyoming. For this group of graduates, teacher pay relative to non-teacher pay is much higher in Wyoming.

- The annual outflow of teachers from Wyoming to teaching positions in the adjoining states is virtually identical to the inflow of teachers to Wyoming from adjoining states.

We found some evidence suggesting growing difficulties in recruiting and retaining teachers.

- The annual turnover rate of Wyoming teachers has increased in recent years. This is true for all age cohorts.

- Wyoming school administrators report greater difficulties in recruiting new and experienced teachers than do administrators in adjoining states.

Employee Compensation

In the following sections we recommend separate formulas for state funding of school district teachers, supervisors, and classified staff. Employee compensation consists of salary and fringe benefits. We first consider salary and then provide a separate discussion of fringe benefits.

Teacher Salaries

The Court has accepted the State's approach for funding teachers based on establishing a competitive starting salary, and adjusting for teacher experience and education, contingent on such funding being adequate to meet the state's educational goals. Our analysis above establishes that the salary levels set for the 2001-02 academic year are adequate to meet the Court's mandate. However, to provide this level of funding requires that the state adjust the teacher funding formula that was established in 1997.

The salary component of teacher compensation consists of 3 parts: first, a competitive starting salary, second, an experience premium, and third, a payment for educational achievement.[8] To establish the starting salary component we examined what Wyoming school districts will pay beginning teachers with a BA degree in 2001.[9] Based on the latest salary schedules we find the weighted average starting salary to be $25,349. This exceeds the starting salaries in Cheyenne ($24,450) and Laramie ($24,000), the Wyoming labor markets viewed as the most competitive for college graduates. The experience premium is paid to each school district as a function of the existing profile of teachers on staff. Based on our analysis of the 2001-2002 salary schedules we have determined that teacher pay should be incremented $773 for each year of experience.[10] We calculate the average number of years of experience to be just over 12.4, resulting in funding of $9,615 for a teacher with the average experience profile. Finally, we calculate the payment for educational achievement to be $1,907.

The teacher funding formula sets a budgeted amount for each fundable FTE consisting of beginning teacher pay plus average educational premium. The recommended funding levels are displayed in Table 14. The experience component is calculated for all FTE on staff, not just those FTEs determined by the prototype. In addition, the experience premium is capped at a maximum payment of 20 experience steps. A review of the literature on the relationship between experience and student achievement reveals that there is little empirical evidence linking teacher experience to higher levels of achievement.[11] Some evidence exists that at the beginning of a

[8] We note that this formulation does not limit the flexibility that districts have in awarding pay. It merely sets a funding level. Districts retain the flexibility to award merit pay or specialization pay if they see fit.

[9] There is no presumption that teacher salary funding should be recalibrated based on current salary schedule data. In fact, current salary schedules are reflective of what is possible under existing funding arrangements.

[10] In the February 23, 2001 ruling the Supreme Court mistakenly opined that the experience adjustment was "revenue neutral to the state," (para 58). In fact, if statewide teacher experience increases, state expenditures on teacher experience increase. If statewide teacher experience declines, state funding would decrease. The same is true for each school district.

[11] In the research literature on student achievement, the effect of teacher experience on student achievement is mixed (Hanushek, 1981, 1986). Some studies find positive effects while others do not. In a survey of this literature, Hanushek (1981, p. 28) notes that in the studies finding positive effects "... the gains from experience are almost completely confined to the first two years of teaching experience." A more recent study of a massive longitudinal

teacher's career experience can have a positive impact on classroom performance but the experience effect is fully realized after but a few years teaching. In an analysis of student achievement in Wyoming we find no statistically significant evidence that the number of years of teacher experience influences student outcomes on a series of standardized tests (see Appendix B). Nevertheless, most school district schedules provide salary premiums for experience steps. The funding formula provides up to 20 steps increments that, like other components of the block grant, can be used by school districts in any way they choose to deliver the "basket of educational services" specified by the Legislature.

We also recommend that the component of the funding model that previously allocated funds for substitute teachers at the rate of $60 per day, multiplied by a 175-day school year, be increased to $68 per day, based on changes in the WCLI. This represents over a 13% increase in funds in this category as part of the block grant.

Table 14: Components of Teacher Funding

Salary Components	Funding $'s per FTE
Beginning Teacher Salary	$25,349
Experience Premium	$773 X years of experience up to 20
Education Premium	$1,907
Total (for average FTE)**	$36,871

**Average experience is 12.438 years.

Classified Salaries

On February 23, 2001 The Wyoming Supreme Court reversed the lower trial court's decision by ruling that administrative and classified salaries "… should be adjusted in a fashion similar to teacher salaries to account for differences in experience, responsibility, and seniority." In drawing an analogy to the method by which Wyoming funds teachers' salaries, the Court has provided guidance for funding classified employee salaries. State funding of teachers in Wyoming is determined by three primary factors: first, the number of teachers are set based on student enrollments; second, teacher pay reflects competitive, entry level, teacher salaries; third,

file tracking every public school student in Texas from grades 3 through 6 reinforces this finding. "There appear to be important gains in teaching ability over the first few years of a career, although there is little evidence that improvements continue after the first couple of years." (Hanushek, Kain, Rivkin, 1998, p.32)

Hanushek, Eric. "The Economics of Schooling: Production and Efficiency in Public Schools." Journal of Economic Literature. Vol. 24 No. 3(Sept., 1986): 1141-77.

Hanushek, Eric. "Throwing Money at Schools." Journal of Policy Analysis and Management. Vol. 1, No. 1, pp. 19-41 (1981)

Hanushek, Eric, John F. Kain, and Steven G. Rivkin. "Teachers, Schools, and Academic Achievement." National Bureau of Economic Research. Working Paper No. 6691 (August 1998).

entry salaries are adjusted for teacher education and experience. This section explores the feasibility of the court's decision.

How portable is this model for classified employees? We believe that certain aspects of the teacher model are applicable to classified staff, but other aspects are either inappropriate or require information to implement that the state does not yet collect. Philosophically, the Court's ruling is consistent with the general block grant approach characterizing not only the funding of teachers, but the entire school finance system. In particular, the teacher funding formula determines the number of teachers funded for each school, but does not mandate the specific task each teacher should perform. It is left to each school district or school to determine how the funding level should be allocated across curriculum categories. Similarly, we believe that it makes sense for the State to determine a classified staffing level for a district, but it would be a mistake for the State to determine precisely what specific mix of classified employee should be hired. Rather, it should be left to the school districts to determine the mix of teacher aides, support personnel, etc. they deem most appropriate.

Setting staffing levels is the first step in determining local personnel budgets. The determination of staffing levels was investigated in the 1997 MAP analysis, to which we make one adjustment here. In that analysis, classified staff were broken into three categories: instructional aides, clerks and data entry personnel, and operations and maintenance personnel. Here we remove operations and maintenance personnel since they are funded in the operations and maintenance portion of the funding model. The remaining categorization recognizes labor market differences between different types of occupations and sets compensation levels accordingly. Implicit in these job definitions are differences in the level of education or training required to provide instructional support, as opposed to ground maintenance, etc. However, since the scope of employment is so extensive for classified employees, we believe it impractical to establish more specific occupational categories. To do so would also reduce some of the flexibility local districts now have to arrange personnel in a manner that works best.

An examination of the actual personnel codes used by the Wyoming Department of Education to track district expenditures reveals the original categorizations to be virtually inclusive (Table 15). Some might question whether the instructional and student support employment codes should be folded under the instructional aide category. The average district-wide average salary for support personnel is 50% higher than for other instructional aides, but with 150 FTEs statewide, expenditures on these job titles accounts for only 12% of instructional aide spending. Therefore, we elect to fold these employees in with other instructional aides, thereby raising average compensation for this category, rather than construct a separate category. Also missing is a categorization for kitchen support staff, representing 7.4% of 2000-2001 classified expenditures. We concur with the 1997 MAP conclusion that this category should be self-supporting and therefore does not require separate state funding.

Once staffing levels are established, appropriate compensation levels must be set. We believe it a mistake to reimburse school districts for actual expenditures as such a system would create the incentive for local districts to hire employees who would receive maximum reimbursement from the state, thereby unnecessarily driving up school funding costs. Rather, we establish funding levels based on statewide average personnel costs from the most recent fiscal

year for which data is available.[12] Table 16 contains the average FTE cost for the two remaining classifications based on actual expenditure data.

We propose that each local school district's classified staff funding level be calculated as the product of the formula driven FTE level and the average compensation contained in Table 16. Thus, for example, a school district whose formula determined staffing level is 5 employees in each staffing category would receive 5 X ($12,306+$20,899) = $166,025.

Note that by disaggregating classified expenditures by broad job areas we are addressing the Court's concern that pay be adjusted for responsibility and education. The differences in the market rates of pay for the jobs reflect implicitly differences in these two factors.

The Court also directed the State to account for the experience of classified employees in determining funding levels. To do so requires that the State collect more extensive data on the characteristics of classified employees. Currently, all that is available through the administrative data files are aggregated salary data. These data provide average salary per FTE by district and 17 job classifications, but do not provide any individual level data that would permit a more detailed analysis. To comply with the Court's ruling we suggest the following methodology. In the first year of implementation, school districts will be provided funding for classified staff as detailed above. In subsequent years, using the first year of implementation as the base year, each school district would report the extent to which the accumulated job experience of the classified staff within each of the classification categories had changed. The average experience profile in the district would increase one year if each of the FTEs on staff increased their job experience one year. Such would be the case for a school district that retained 100% of its staff for the full year. Those districts that replaced more experienced workers with less experienced workers would report a decline in its experience profile. Greater than one year per FTE increases would be realized if inexperienced staff was replaced by more experienced staff. For each per FTE increase in the experience profile of a category, above the base year level, average wages would be adjusted upwards (downwards in the case of a decline).

Based on our analysis of the returns to experience for classified staff contained within the classified staff salary schedules we recommend that the Wyoming statewide average increase in salary for a year's additional experience (one step increase) be 1.2% of the average salary paid for each broad classification in 2000-01. This rate of increase is approximately half the percentage increase for teachers. Classified employees have far less education than teachers on average, and the wage experience of lower educated workers in the U.S. economy has been much slower wage growth than educated workers. Furthermore, unlike teachers, classified employees receipt of experience premiums would not be capped under this mechanism.

The above mechanism reflects a series of compromises that must be made given the current practice of failing to maintain data files on the experience level of individual employees. We recommend that the Wyoming state system develop the capability to keep such records. If, and when, they do, we would recommend that experience premiums for classified staff only be paid for 10 years, thereby reflecting the limited enhancement of skills that occurs in these jobs beyond 10 years. In fact, a number of Wyoming districts limit step increases to 10 years, and

[12] Salary values from 2000-01 can be updated using the WCLI.

some have as few as 5 step increases for classified personnel. Fewer step increases would require larger payments for each increase in order for salaries to remain competitive. We recommend a 10 year capped schedule awarding 2.1% annually based on our analysis of the average present value return to classified staff over a 10-year period. Implementation of this system would require that the State also calculate the average level of experience of classified staff in 2000-01. This average level of experience is already folded into the average compensation levels that are used in the classified staff funding formula (much in the same way that they were for teachers in the original MAP formulation), and would have to be removed from the average salary totals. Additional awards for experience could be calculated as deviations from the average experience level.

Table 15: Classified Personnel Categories

Code	Title	FTE	Avg. Salary	% Payroll
1110	Elementary Instructional Aide	440.2	$11,932	5.9%
1120	JHS Instructional Aide	82	$12,333	1.1
1130	High School Instructional Aide	70.6	$12,829	1.0
1210	Special Instructional Aide	952.5	$11,498	12.3
2100	Student Support Services	79.5	$18,849	1.7
2200	Instructional Support Services	77.9	$16,206	1.4
2222	Library/Media Aide	159.6	$12,748	2.3
3310	Secretary/Clerical – Central Office	168.7	$22,616	4.3
3320	Secretary/Clerical – School	600.7	$18,114	12.2
333x	Business Office Personnel	159.4	$24,243	4.3
3350	Board of Trustee Support	1	$42,680	0%
3400	Operations and Maintenance	1194	$21,594	28.9
3501	School Bus Drivers	598	$16,607	11.1
3502	Mechanics	76	$26,583	2.3
3800	Central Support Services	55	$27,529	1.7
4102	Cooks and Servers	544	$12,174	7.4
4300	Community Support	15	$18,404	.3%
OTHER	Other	80	$18,250	1.6%
ALL	All Employees	5354	$16,647	100%

Table 16. Average Compensation by Category

Title	Codes	FTE	Avg. Salary
Instructional Aides	1110,1120,1130,1210,2100,2200,2222	1862	$12,306
Clerks and Data Entry	3310,3320,333x,3350	930	$20,899
Operations and Maintenance	3400,3501,3502	2797	*

*Funded separately through the Maintenance and Operations provisions of the funding model. See: MAP Report, "Modifying the Maintenance and Operations Adjustment to Comply with the Ruling of the Wyoming Supreme Court (preliminary)," Gerald C. Hayward, January 3, 2002.

Supervisor Pay

In commenting on the state formula for funding school administrators' compensation, the Wyoming Supreme Court wrote: "Salaries for administrators, including superintendents and principals, are based on statewide averages. The average salary bears no relationship to the size of the school or district or to the relative responsibilities of the employees." The Court directed the State to develop a formula that would take these factors into account by July 1, 2002.

District Administrators

We analyze the determinants of central office staff compensation using Wyoming Department of Education data. Our dependent variable is the FTE salary of central office administrators in Fall 2001.[13] Our model relates administrative salaries to measures of supervisor experience and education, and district size. We also control for the job title of the administrator (Job). Our measures of education are whether the person holds a master's degree (MA) or a doctorate (DOCT). Finally, we have a measure of the years of district experience in the job classification. To estimate the effect of these variables, we fit an OLS regression model:

$$\textbf{FTE Salary} = B_0 + B_1\,\textbf{Job} + B_2\,\textbf{DistSize} + B_3\,\textbf{MA} + B_4\,\textbf{DOCT} + B_5\,\textbf{Experience} + e$$

Selected regression coefficients and related statistics for central office administrators are reported in Tables 17 and 18 below.

Table 17: Central Office Staff: Mean Salaries, Fall 2001

	Mean FTE Salary
Superintendent	$80,737
Asst. Superintendent	$77,428
Business Manager	$49,845

[13] The regression is limited to Superintendents, Assistant Superintendents, and Business Managers as other central office administrative staff are funded elsewhere in the funding model.

Table 18: Central Office Administrators Earnings Regression[a]
Dependent Variable = Fall 2001 FTE Salary

Variable	Mean	Coefficient	t-value
District Enrollment	2360.8	3.16	9.83
District Experience	5.32	159.5	4.47
MA	.630	4353.4	1.26
Doctor	.180	9167.4	3.94
Adj. R-Sq.	---	.836	---
N	100	100	100

a. The regression model also includes two indicator variables for job classification.

The regression equation explains 84% of the variation in central office staff administrative pay. Three of four regression coefficients are statistically significant at the 5 percent level or higher. The regression shows that holding all else equal, each additional student in the district raises average pay of administrators by $3.16. Each additional year of district experience raises pay by $159.5. Administrators with an MA, on average, earn $4,353 more than those with less schooling, all else equal. Administrators with a doctorate earn the MA premium plus an additional $9,167.

We recommend that the funding formula incorporate these regression results by comparing each districts enrollment and central office administrative staff's experience and education profile to the state average, and adjustments to funding be made accordingly. [14]

School Administrators

Determining compensation for building-level supervisors requires a similar analysis. In Fall, 2001 the average FTE salary of an assistant principal and a principal in Wyoming was $56,676 and $62,214, respectively. In order to determine how these salaries varied with responsibility, education, and experience, we estimated an OLS regression equation for principals and assistant principals of the following form:

$$\textbf{FTE Salary} = B_0 + B_1\,\textbf{Job} + B_2\,\textbf{SchoolSize} + B_3\,\textbf{Education} + B_4\,\textbf{Experience} + B_5\,\textbf{MultiSchool} + e$$

Job indicates whether the administrator is a principal or assistant principal, SchoolSize is enrollment in the school, Education measures whether the person has an MA or Ph.D., Experience indicates the district experience of the person as a principal or assistant principal, and MultiSchool indicates whether the administrator works at more than one school. (Principals are shared in many Wyoming schools.) The selected regression coefficients are reported in Table 19 below.

[14] The effect of continuous independent variables such as enrollment in a regression equation should be interpreted as changes around the mean. Thus, on average, administrators with one additional student above the Wyoming mean earn $3.16 more and administrators with one student below the Wyoming mean earn $3.16 less.

Table 19: School Building Administrators Earnings Regression[a]
Dependent Variable = Fall 2001 FTE Salary

	Mean	Coefficient	t-statistic
District Experience	4.60	498.2	5.98
MA	.955	1872.3	.88
Doctorate	.056	2767.2	1.48
School Enrollment	439.1	8.62	5.34
Adj. R-square	---	.291	---
N	269	269	269

[a] Other regressors include job classification (principal, assistant principal), and whether the individual administers multiple schools. For multi-school administrators, school enrollment is defined as the sum of enrollment in all schools.

The coefficients take their expected signs, however, only District Experience and School Enrollment are statistically significant at the 5% level. All else equal, school administrators earn $498 more for each additional year of experience. School administrators holding an MA earn $1,872 more than administrators whose highest degree is less than an MA. Administrators who hold a doctorate earn the MA premium ($1,872) plus an additional $2,767. Higher enrollments generate additional compensation at the rate of $8.62 per student.

As in the case of district level supervisors, we recommend that the composition of each district's building level supervisor be compared to the state average and adjustments be made for experience, education, and building enrollments.

Fringe Benefits

In addition to salaries, the Wyoming finance formula provides school districts with funding for employee fringe benefits. The Supreme Court's February 23, 2001 decision did not require any change in the methodology for constructing fringe benefits. The current funding model provides a 19% fringe benefit rate intended by MAP to cover mandatory, employer funded, fringe benefits consisting of social security, Worker's Compensation, unemployment insurance, plus employer contributions to the state retirement plan.

Table 20 displays fringe benefit costs as a percent of salaries by category. Employer contributions for FICA are set at 7.65% of the FICA wage base ($84,900 in 2002). Because some employees earn more than the wage base, the 7.65% rate slightly overstates true school district costs in this category. Worker's Compensation payments are made only on personnel in certain occupations, exempting for the most part teachers and educational administrators. Worker's Compensation premiums paid by school districts average just over $2.7 million annually during the three-year period from 1999-2001. This translates into an effective fringe benefit rate of .66% based on our estimate of the annual school district total wage bill.[15] School districts in Wyoming reimburse the State Unemployment Insurance system for unemployment payments made to school district employees. From 1998-2000, the last three years for which we have complete data, annual school district payments average $264,000, an effective fringe benefit cost of .06%, of the $407,000,000 wage base. In total, mandatory fringe benefit costs represent 14.05% of payroll, leaving 4.95% unallocated from the 19% funding rate.

Thus, the 19% rate is more than ample to cover mandatory, employer paid fringes, and is able to cover a significant portion of the employee share of retirement plan contributions. In practice Wyoming school districts have chosen to pay the employee share of the retirement benefit (5.57%) as well, although they are not required to do so. So far as we were able to determine, this is not the practice in most of the surrounding states. We asked education department officials in the six surrounding states whether education employees contribute to their state plan. In five of the six states surrounding states, school employees are required to contribute to their retirement plan. Only in Utah does the district make the entire contribution.

The funding model also provides funding to cover employee health insurance. We use district data collected by the Wyoming Education Association on fiscal year 2001-02 health insurance costs for 48 Wyoming school districts. We computed FTE-teacher weighted means for the school districts costs of the health insurance policies offered. Approximately 35% of teachers elect single policy coverage, the others electing either various forms of family coverage. Most districts pay virtually all of the cost of single coverage but only varying proportions of family coverage. On average, school district health insurance costs averaged $4,890 per fte for 2001-02.

[15] Based on school year 2000-2001 General Fund expenditure data, $407 million was spent by school districts on salaries.

Table 20: Mandatory Fringe Benefit Costs as a Percent of Salaries

Category	Tax as Percent of Salary
FICA	7.65%
Worker's Comp	.66%
Unemployment Insurance	.06%
Retirement	5.68%
Total	14.05%

Source: Authors' calculations from data provided by Wyoming Department of Education, and Wyoming Department of Employment.

Table 21 incorporates the 19% fringe benefit base along with the estimated annual cost of health insurance, to show funding per FTE teachers under the original MAP model, as compared to our funding recommendation for 2001-2002.

Table 21. Personnel Costs Per FTE Teachers

	1996-97	2001-02
Average Teacher Salary	$ 31,758	$ 36,871
19% Fringe Benefits	$ 6,034	$ 7,005
Health Insurance	$ 3,641	$ 4,890
Total Compensation	$ 41,433	$ 48,766

Sources: 1996-97 values from MAP Associates (1997, Figure 11, p. 37). 2001-02 values computed by authors. See text.

We propose fringe benefits be calculated at the same 19% fixed percentage of salaries and annual health insurance costs be funded the same as those of teachers, for classified staff and supervisory personnel.

Appendix A: Analysis of Wyoming and Surrounding States' Salary Schedules

Salary schedule data was included for all school districts reporting salary schedules. Separate calculations were conducted for 1997-98 and 2000-01. Not all districts reporting in 97-98 reported in 2000-01 and visa versa, a result of survey non-response, school district consolidation, new districts, etc. We believe these missing data have a relatively insignificant effect on our results as the districts that were least likely to respond or not report salary schedules were quite small and thus would have a relatively small impact on weighted averages. In those cases where districts only reported part of the salary schedule asked for, we included what was reported in our calculation of the specific item, but excluded the non-response from other items. Thus, we have a more complete sample for BA step 1 than we do for MA maximum. Note also that for some districts the highest salary available (Schedule Max) was what was paid for a MA maximum. Either FTE counts or enrollment counts are used to weight the data. In those districts that reported salary schedules but failed to report FTE or enrollment numbers, we attempted to impute the requisite weight be either calculating a statewide average pupil teacher ratio and using the available data to impute the weight, or by using the level reported in the other year, if available. There were only a few districts where this imputation was necessary, having very small effects on our weighted average calculations. To the extent that the missing districts pupil teacher ratio was identical to the state average, or to the extent that enrollment or FTE numbers were stable from 1997-98 to 2000-01, no errors were introduced by this imputation. Even if the patterns were quite different, the error introduced would be quite small because of the relatively small size of these districts.

Appendix B: Student Achievement: The Role of Teacher Education and Experience

MAP was interested in exploring the relationship between student achievement and teacher education and experience (2 key components of the salary schedule). The relationship between teacher quality and student achievement has been the focus of considerable research. There is broad agreement that student achievement is the consequence of multiple factors including family, individual, and educational inputs. As such, it is important to account for these factors in any research design. Furthermore, it is recognized that achievement at any given point in time will also reflect past achievement, and cannot be solely credited to contemporaneous factors. Researchers have attempted to remove past influences on achievement today by estimating value-added models. By focusing on changes, rather than levels, the researcher attempts to isolate contemporaneous inputs on contemporaneous achievement. Even with this estimation strategy, coefficient estimates may still be biased due to a number of econometric issues.

Despite recognition of the various econometric issues that plague efforts at estimating the relationship between school inputs and student achievement, most data sets that have been collected are not rich enough to support the proper econometric specification. Probably the most common study has taken the form of a cross-sectional, contemporaneous regression where the level of student achievement (on average) is explained by average characteristics and inputs. Often these variables are aggregated to the school district level, raising the additional question of what the transmission mechanism is.

The data provided for the Wyoming analysis also suffers from many of the shortcomings identified above. The achievement data consists of median test scores at the school level for standardized tests in mathematics, reading, and writing in the 4^{th}, 8^{th}, and 11^{th} grades. Explanatory variables consist of teacher characteristics, pupil characteristics, and school inputs. Teacher characteristics are measured by whether the teacher has a master's degree and the years of experience in the district and in the state. The data permits a calculation of the percent of teachers within a school that have a master's degree, and the average level of experience within a school (mean or median). The assumption is that the median student outcome reflects a student who has been taught by the teacher with the average (mean or median) level of education and experience. In fact, test scores are grade levels outcomes and teacher characteristics are for the whole school. Pupil characteristics are measured by student ethnicity and receipt of reduced or free lunch. We calculate the percentage of students who are nonwhite and qualify for subsidized lunch from this data, noting again that the student with the median score may not actually have these characteristics. Another interpretation is that these variables can be considered peer effects. In that case we have no variable to capture the specific characteristic of the student taking the test. Finally, the school inputs variable is measured by the pupil-teacher ratio. We construct this ratio by dividing the number of pupils taking the test by the number of FTE's in the school. This results in very low ratios as teachers staff many classrooms other than the 4^{th}, 8^{th}, and 11^{th} grades. However, as long as the ratio of total teachers in the school to teachers in the grade testing classrooms is not systematically related to performance, across school districts, this assumption does not create a problem. Of course, if families who place a greater value on

education choose schools with more teaching faculty, this would create estimation problems. There is nothing we can do about this problem with this data set.

In addition to the problems with the data we do have are the problems associated with not having data we should. In particular, the inability to estimate a value-added model is unfortunate. We also have an incomplete set of variables to measure student characteristics, family characteristics, school inputs, and teacher quality.

Nevertheless, we estimated 9 regression equations to investigate the relationship between teacher characteristics and student achievement. The regressions use weighted least squares with the weights being the number of pupils in each school taking the specific test. The dependent variable measures median achievement for students in a school taking a standardized reading, writing and mathematics exam, in the 4^{th}, 8^{th}, and 11^{th} grades (3 exams x 3 grades = 9). Each dependent variable is regressed on the average district experience, average state experience, percent of teachers with master's degrees, percent of test takers who are non-white, percent of test-takers receiving subsidized lunch, and the pupil/teacher ratio. Table B1 provides the sample size and goodness of fit statistics for each regression. None of the coefficients on the teacher characteristic variables were statistically significant. 15 of the 18 coefficients of the student characteristic variables were correctly signed and statistically significant. Three of the pupil-teacher ratio coefficients were statistically significant. Table B2 summarizes the results. These results are consistent with the vast bulk of previous research conducted on different data sets from different schools in different time periods.

In summary, we find no statistically significant evidence that teacher characteristics rewarded in the pay schedules are correlated with student standardized test outcomes.

Table B1

Dependent Variable	Goodness of Fit (R^2)	Sample Size
4th Grade Math	.35	201
4th Grade Reading	.33	201
4th Grade Writing	.26	201
8th Grade Math	.37	84
8th Grade Reading	.28	84
8th Grade Writing	.35	84
11th Grade Math	.24	79
11th Grade Reading	.20	79
11th Grade Writing	.19	79

Table B2

Independent Variable	Fraction Correctly Signed	Fraction Correctly Signed and Statistically Significant (10% level)
District experience	4/9	0/9
State experience	2/9	0/9
Master's degree	8/9	0/9
Percent non-white	9/9	8/9
Percent subsidized lunch	9/9	7/9
Pupil/teacher ratio	7/9	3/9

Appendix C

Survey on Teacher Hiring for 2001-2002 School Year

Please provide us with information about your hiring experiences for the 2001-2002 school year. For each area shown in the table below, please indicate the number of positions for which you are or did recruiting for the coming school year, the number of qualified applicants that applied for those positions, and the number of positions that you filled with qualified applicants.

Elementary Education	**# Positions Recruited**	**# Qualified Applicants**	**# Positions Filled with Qualified Applicants**
Regular Teachers			
Special Education Teachers			
Specialists (e.g., Art, Science)			
Administrators			
Counselors			
Secondary and Middle School			
Mathematics Teachers			
Science Teachers			
Language Arts / English Teachers			
Social Studies Teachers			
Foreign Language Teachers			
Health / PE Teachers			
Art Teachers			
Music Teachers			
Vocational Teachers			
Administrators			
Counselors			

In the questions below, please mark your response for each statement that best describes your opinion.

	Strongly Agree	Agree	Disagree	Strongly Disagree
The compensation we offer *starting* teachers is usually adequate to compete with other districts to hire staff.	1	2	3	4
The compensation we offer *experienced* teachers is usually adequate to compete with other districts to hire and retain staff.	1	2	3	4
We now find it more *difficult* to hire teachers than we did 5 years ago.	1	2	3	4

Please check this box if you would like to receive a copy of the results of this survey. ☐