THE ALLIANCE FOR QUALITY TEACHING

Shining the Light:

THE STATE OF TEACHING IN COLORADO

FALL 2006

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EXECUTIVE SUMMARY

The research is clear; teachers are the single most important factor in improving student achievement. A variety of studies have shown that an effective teacher can be more important to student learning than a child's race, family income, parents' education, or any other external factor often thought to dominate school outcomes.

If teacher quality is vital to student achievement, then we need to know how teacher quality is distributed in Colorado. Do all students in our state have access to high quality teaching? Does access depend on the location, size, economic conditions and other characteristics of the communities in which children live? What should policymakers, educators, teacher preparation institutions and state agencies be doing to ensure that all students in this state - whether they live in a front range city, a farming community on the eastern plains, a resort or ranching town on the western slope or in the San Luis Valley - will have a quality teacher when they walk into their classrooms tomorrow?

The purpose of *Shining the Light: The State of Teaching in Colorado* is to examine issues of teacher quality in Colorado and provide recommendations for improving the quality of instruction for all students across the state. The report has four major components:
1. A review of the educational landscape within which teachers teach in Colorado.
2. A description of the teacher workforce in Colorado.
3. The allocation of teacher quality across the state.
4. Conclusions and recommendations about Colorado's policies and supports for quality teaching.

This Executive Summary highlights the key findings and recommendations. The full report contains extensive analyses and a complete set of findings and recommendations. The full report and this summary were produced by the Alliance for Quality Teaching (AQT) and is the first edition of what will be an annual report on the state of teaching in Colorado. The Alliance is a nonpartisan coalition of policymakers, stakeholders and practitioners with the mission *to ensure that Colorado children have a quality teacher in every classroom, everyday.*
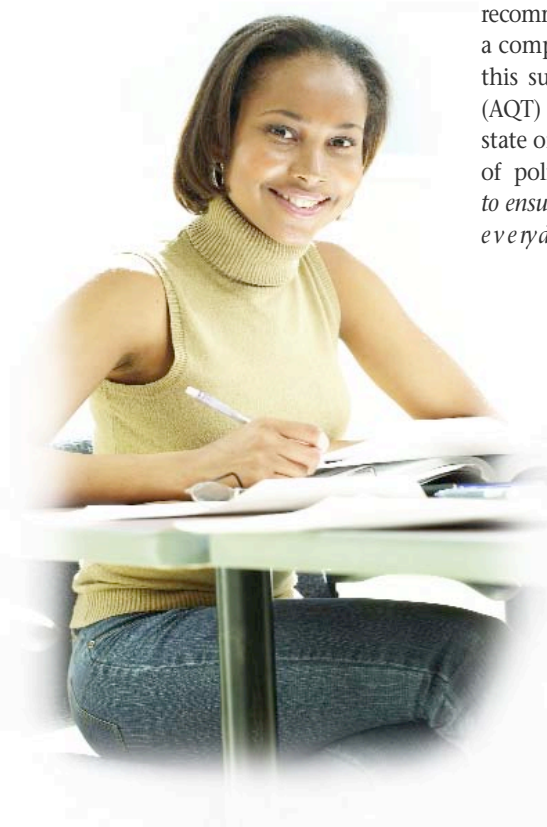
KEY FINDINGS

- **Teachers in Colorado work in many different environments.**
    - Colorado teachers work in 178 districts that range in size from tens to tens of thousands of students. Seventy-five percent of Colorado's K-12 students attend schools in only 20 districts.
    - Colorado teachers work in schools that are diverse in enrollment of minority students and students in poverty.
        - Schools range from those that have no minority students to 100% minority.
        - Minority students and students eligible for free and reduced lunch are concentrated in urban areas on the Front Range and the southern part of the state.
    - Although the student population is increasingly more diverse, the teacher workforce remains predominately white and female.

- **There is a teacher gap in Colorado that is widening and correlated with student achievement.**
    - Less qualified teachers, higher teacher attrition rates and lower teacher salaries are more likely to occur in Colorado schools that serve high proportions of minority students and students eligible for free and reduced lunch (Teacher Gap).
    - The teacher gap varies by district.
    - The teacher gap is correlated with student achievement.
    - The teacher gap has increased since 2000.

- **The data about teachers in Colorado are incomplete, inhibiting the ability to improve teacher quality and student achievement.**
    a. Data is either incomplete or unavailable to answer some of the most important questions to Colorado policymakers, practitioners and parents. These questions include:
        - Which teachers are most effective in promoting student achievement?
        - Where do these teachers work in Colorado and why?
        - What policies and programs best support the development of quality teachers who are most effective in promoting student achievement?
        - Are quality teachers distributed equitably among diverse classrooms?

KEY RECOMMENDATIONS

The findings in this report clearly describe the diversity of environments in which teachers teach. Thus, although the Alliance for Quality Teaching seeks a quality teacher in EVERY Colorado classroom, single policy solutions are not likely to fit the diverse needs of each school and district. The recommendations below are intended to guide Colorado toward local and statewide decisions that will drive policies toward increased teacher quality and a reduced teacher gap.

1. The Legislature and governor should appoint a Colorado Teacher Gap Commission.

The Commission should be made up of representatives of the community, teachers, parents, professional associations, advocates, researchers, higher education, school district administrators, and local/state policymakers with the explicit charge to systematically seek answers and provide solutions to the following questions:

a. What local and state policies and practices have helped close the teacher gap?

b. What local and state polices and practices exacerbate the teacher gap?

c. How are/can state and local policies and practices be evaluated to assess progress?

d. Which specific policy tools would help local and state policymakers close the teacher gap throughout Colorado?

e. What accountability measures need to be in effect at state, district and school levels?

2. Colorado state agencies and school districts should work together to improve data collection, access and use.

Providing more useful data to state and local policymakers in order to effectively improve student learning is critical. For state level data to become a more useful resource, it is recommended that:

a. The Legislature direct funding to the Colorado Department of Education (CDE) and Colorado Commission on Higher Education (CCHE) to develop a unique teacher identifier that allows linking of students and their teachers, including a clearly defined policy to balance protections and benefits.

b. The Legislature and the State Board of Education direct CDE to develop a clear policy for sharing data with schools, districts, policy researchers and advocates to support accountability and improved student learning.

c. The State Board of Education direct CDE to work with the Alliance for Quality Teaching to convene a technical advisory group of data experts to ensure accurate and valid implementation of establishing a unique teacher identifier.

d. The State Board of Education direct CDE to work with school districts and other educational organizations to increase the capacity to use data for accountability and student achievement.

3. **The Alliance for Quality Teaching and other organizations should conduct additional research to support policy and practice around teacher quality in Colorado.**

It is clear that many questions about teacher quality in Colorado remain unanswered. Some of the questions that should be addressed are:

a. What is the relationship between the diversity of the teacher workforce, the diversity of the student population and reducing the achievement gap?

b. What are the most pressing issues in terms of teacher supply and demand?

c. What practices in teacher preparation programs prepare quality teachers who help close the achievement gap?

d. What programs and practices at the district level are effective in attracting, hiring and retaining high quality teachers?

e. What programs, practices, and teacher characteristics shape teachers' ability to reach the broad democratic goals for public education?

The system of education in Colorado is complex and includes many varied stakeholders. If we are to achieve success in improving student achievement through increased teacher quality, we need strong leadership and a coordinated strategy. We must work together toward our goals to become even more powerful than we are now. The status quo cannot continue - our children and their future are much too important.

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF TABLES

INTRODUCTION

While Colorado is near the top of the nation in college degrees per capita, it is near the bottom when it comes to sending its own high school graduates through college. Hopes are even dimmer for minority students, with less than half of the Hispanic students who enter high school in Colorado estimated to graduate (Colorado Children's Campaign, 2005). This "Colorado Paradox" will present a challenge to Colorado's economic growth and the future of its children as more jobs require college degrees.

Problematic as well is the relatively large and persistent "achievement gap" between Colorado's white and minority students as well as between low-income and non-poor students (Teske, Brodsky & Medler, 2006).[1]

The research is clear. If we are to improve student learning, teachers are the single most important factor (Rice, 2003; Sanders and Rivers, 1996; Hanushek et al., 1998).

When a Colorado student walks into his or her classroom tomorrow, will he or she have access to a quality teacher? The work of the Alliance for Quality Teaching aims to ensure that they do.

With the future of Colorado's children at stake, the Alliance produced this report - the first edition of what will be an annual report about the state of teaching in Colorado. Our intent is to provide information to policymakers and others to assist them in making good decisions in support of quality teaching. Ultimately, we want every child in Colorado to walk into a classroom that holds a quality teacher for him or her every day.

The purpose of this report is to examine issues of teacher quality in Colorado and provide recommendations for improving the quality of instruction for all students across the state. The report has four major components:

1. A review of the educational landscape within which teachers teach in Colorado
2. A description of the teacher workforce in Colorado
3. The allocation of teacher quality across the state
4. Key findings and recommendations about Colorado's policies and supports for quality teaching

OBSERVATIONS As one reads through this report, several threads will become obvious. First, there is great diversity in the landscape within which Colorado's teachers teach, in teacher preparation, and in teacher distribution. Second, although a great deal of data are available, conclusions could not always be drawn due to missing information. Third and most important, there is a significant gap in the distribution of teachers between poor/minority/low-achieving schools and affluent/white/high-achieving schools - and this gap is growing.

[1] The achievement gap is the difference in performance between minority and white students or between free and reduced lunch (FRL) and non-FRL students on the Colorado Student Assessment Program (CSAP).

THE ALLIANCE FOR QUALITY TEACHING The Alliance for Quality Teaching (AQT) is a nonpartisan coalition of policymakers, stakeholders and practitioners with the mission *to ensure that Colorado children have a quality teacher in every classroom, every day.* The Alliance believes that quality teaching is the most important factor in improving student achievement.

The AQT focuses on three activities to help advance its mission: research, networking and advocacy. This report is one of the Alliance's research activities. The report will also be used to generate policy change by engaging education stakeholders in dialogue around the information it supplies and the issues it raises.

THE AUTHORS The content of the report was guided by the AQT Research Committee (see list below). It was written by AQT staff and a researcher at the Center for Education Policy Analysis (CEPA), Graduate School of Public Affairs at the University of Colorado at Denver and Health Sciences Center, headed by Paul Teske, PhD. CEPA focuses its work on preK-12 policy issues (teacher quality, governance, finance, leadership, management, as well as school choice, competition and parent information issues) and higher education systems integration issues.

THE DATA The data presented here was provided by Colorado's state public education agencies (Colorado Department of Education and Colorado Commission on Higher Education) through either the web sites or in response to special requests from the Alliance. The Alliance acknowledges the cooperation of the staff at these agencies in meeting data requests. The most recent available data are used and may vary in the school year between 2004 (SY 2004-05) and 2005 (SY 2005-06) depending on availability.

Special Acknowledgement & Dedication

Generation of the idea to create an annual report on the state of teaching in Colorado came from former Colorado Commissioner of Education, Cal Frazier. Cal was instrumental in formulating the concept, as well as in creating the AQT. With his passing in 2006, the State of Colorado lost not only a friend of education, but also a fierce advocate for children. The Alliance Board of Directors acknowledges the legacy of Cal Frazier by dedicating this first report to Cal and his family.

Acknowledgements

ALLIANCE FOR QUALITY TEACHING BOARD OF DIRECTORS

1. WHY TEACHER QUALITY IS IMPORTANT

That *all children learn* has been the goal of Colorado's 12 years of standards-based reform. Teacher quality is the central tool in reaching that goal. As confirmed by research, teachers are the single most important factor in improving student learning (Rice, 2003; Sanders and Rivers, 1996; Hanushek et al., 1998).

The advent of standards-based education also has created new data on teacher quality. Regular assessment of students over time provides the opportunity to learn about teachers' contributions to student learning, often called "value-added." Studies about value-added have shown that an effective teacher can be more important to student learning than a child's race, poverty level, parents' education, or any other external factor often thought to dominate school outcomes. For example, researchers using value-added data from Tennessee found that students with the most effective teachers for three years in a row outperformed students with the least effective teachers by 50 percentile points on a 100-point scale regardless of race, poverty or other external factors (Sanders and Rivers, 1996). Similarly, researchers measuring student learning in mathematics in Texas concluded that "…having a high quality teacher throughout elementary school can substantially offset or even eliminate the disadvantage of low socio-economic background." (Hanushek et al., 1998).

The research has provided some indicators of quality in teachers:
- Experience is very important. Brand new teachers have a lot to learn and their ability to support student learning increases greatly during their first year. The growth in quality continues through, at least, the first several years of teaching (Hanushek et al, 1998; Clotfelter et al, 2004).
- Ability matters. Teachers with higher scores on college admission or licensure tests as well as those from more selective colleges are better able to support student learning (Rice, 2003;Wayne and Youngs 2003; Reichardt, 2001b).
- Teachers' subject matter knowledge, particularly in secondary science and mathematics, helps students learn those subjects (Rice, 2003; Wayne and Youngs, 2003; Reichardt, 2001b).
- Teacher preparation and training make a difference in student learning, particularly in their first years of teaching (Rice, 2003; Allen, 2003; Boyd et al, 2005).

Another factor may also be important: teacher diversity. There is emerging evidence that students learn better from teachers of similar racial and ethnic background (Dee, 2001; Hanushek et al. 1998).

The link between licensure status (i.e. emergency, alternative, initial, and professional) and student achievement, however, has not been clearly established. Confusion often exists between the need for teachers to be well prepared and to be licensed. Similar confusion enters the debate when examining "Highly Qualified" teachers (defined by Colorado under the Federal No Child Left Behind [NCLB] regulations) compared to "quality" teachers. NCLB requires that all teachers in core subjects be "Highly Qualified" teachers by being fully licensed and having subject matter expertise.[2]

The Alliance, however, seeks "quality" teachers defined in part by the indicators determined in previous research as noted above.[3] The strongest link between the Alliance's teacher quality indicators and student learning is in mathematics; therefore this report will focus on mathematics as a measure of student outcomes.

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[2] Core subjects are English, reading, language arts, mathematics, science, foreign languages, civics and government, social studies, economics, arts, history, geography, and Kindergarten through Grade 6 (K-6).

[3] While not examined in this study, the Alliance also believes that quality teachers are those who help students achieve the broad democratic goals defined by the public.

2. DATA USED IN THIS REPORT

The Colorado Department of Education (CDE) provided a large majority of the data used in this report. Both student and teacher data are used in order to paint a picture of the landscape within which teachers teach, as well as link student achievement to teachers where possible.

CDE publicly available data were used in this report. Included were school level student enrollment information by race and by free and reduced lunch (FRL) status, as well as assessment results. CDE also provided additional data in response to formal requests from the Alliance for Quality Teaching. These data included student demographic and School Accountability Report (SAR) data in a more user friendly format than is available on the web, information from the Human Resources (HR) dataset and information from the HR dataset combined with information from the state's licensure records.

The HR dataset provides individual information on all teachers in the state, e.g. experience, work assignment, salary, education level, and where they received their highest degree. This information forms the core of the analysis in this report.

Since there is no way to directly link teachers with the students they teach - an issue discussed in more detail below - the unit of analysis for much of this report is the school. Data on students and teachers are aggregated to the school level. Since the SAR data contain multiple records for schools that serve more than one grade level (i.e. elementary, middle school and high school), only one SAR record per school was used in this analysis to avoid double counting teachers assigned to the same school. The higher grade level was used when there were multiple records for a school since secondary teachers, particularly those in math and science, were deemed more important due to potential shortages in those subject areas.

DATA CHALLENGES

There were two significant issues with the data available for use in this report.

1. No unique teacher identifier that allows linking of teacher records across years

While CDE collects teacher identifier information, i.e. name and social security number (SSN), CDE did not provide this information in order to protect the confidentiality of the teachers. Because of the lack of a consistent teacher identifier, this report is unable to include information on:

- teacher attrition by experience and subject taught
- teacher movement between schools and districts
- returning teachers, i.e. teachers who take a year or more off and then return to teaching
- movement of teachers in and out of other industries (can only be done with a SSN)

2. Lack of a means to link teachers with their students

Currently, CDE does not collect data that would allow this link to be made, while many other states do.[4] While Colorado has a unique student identifier, both unique teacher and student identifiers are required to link teachers with students. In addition, a well defined system to match teachers with students is necessary (for example: detailed information on school schedules).

The inability to link teacher and student data reduces the scope of the analyses in two ways. First, our analyses of the gap in teacher quality can only be done at the school and district level. As data from other states suggest that poor and minority students are more likely to be assigned a less qualified teacher within schools (Clotfelter et. al., 2004), it is as likely that the disparity in teacher quality is as large within schools as it is between them. Therefore, our estimates of the disparity in teacher assignments[5] provided in this report are at the minimum. Conversely, while the assumptions may underestimate the overall difference, it is possible that the disparity may be overestimated in some schools and/or districts.

The second and larger challenge is that the lack of a link between students and their teachers does not allow analysis of each teacher's contribution to student learning, i.e. value-added. This means we are unable to directly analyze some of the most important questions to policymakers, practitioners and parents:

• Which teachers are most effective in supporting student learning?
• What policies and programs best support the development of those effective teachers?
• Are effective teachers being assigned in an equitable way?

The data issues identified above had a great impact on the level of research questions that could be addressed in this report. These same restrictions apply to researchers and others interested in teacher quality and improving education in Colorado.[6]

[4] For examples see the Florida K-12 Data Education Warehouse at http://edwapp.doe.state.fl.us/doe/, or the North Carolina Education Research Data Center at http://www.childandfamilypolicy.duke.edu/nceddatacenter.html.
[5] It should be noted that the placement of teachers in specific classrooms is sometimes due to assignment by the school administration, but is also sometimes affected by a teacher's choice. This is dependent upon individual school and district contracts or other formal and informal agreements.
[6] Data on students and teachers is a central tool to improve student learning. Data can provide feedback and support accountability of schools, districts and teacher preparation institutions if data are available, clean and in an appropriate format. In addition, people must have the skills necessary to use the data (O'Day, 2002).

3. COLORADO'S DIVERSE EDUCATIONAL LANDSCAPE

It is important to consider the context within which teachers teach when researching the quality of teaching. As such, the diversity of Colorado's public education landscape - enrollment, enrollment growth and minority enrollment - will be clearly depicted in this chapter of the report.

Colorado's 47,000 teachers work in over 1,700 schools that range in size from one student to over 3,000 students. These schools represent almost every combination of grade ranges including single grade schools and schools that serve all grade levels. Colorado's 178 school districts are also diverse in terms of demographics, economics, size and locale.[7]

STUDENT ENROLLMENT

Figure 1 is a map that shows districts by the cumulative percentage of all enrolled students within the state. The map shows cities with colleges or universities that prepare teachers and interstate highways (I-70 running east to west across the plains and through the mountains, I-25 running north to south along the front range, and I-76 running from Denver to the northeastern corner of the state).

The data show that the largest 20 districts enroll 75% of the state's students (Figure 1). These 20 large districts are the darkest shade of blue; each enrolls 10,000 or more students. Nineteen of these 20 districts are on the Front Range; the other is Mesa, which serves Grand Junction. The map also shows that the

Figure 1: Map of District Enrollment, 2005
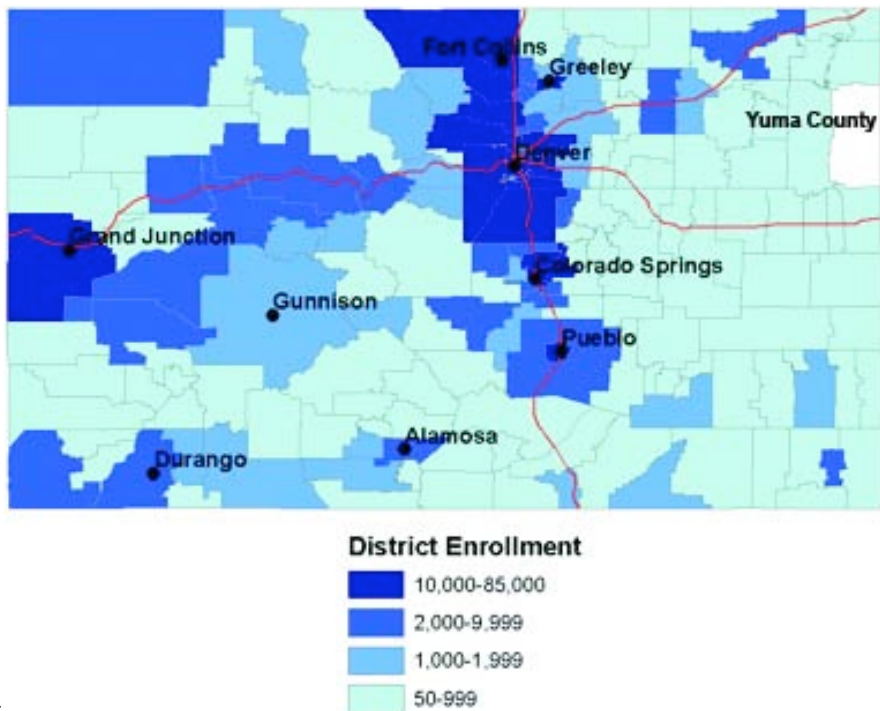
Source:
CDE Public Data

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[7] Colorado has 178 traditional districts. However three Boards of Cooperative Educational Services (BOCES) employ teachers. These teachers will be included as appropriate in this study.

majority of the districts (112, light blue) enroll five percent of the students. These smaller districts each enroll less than 1,000 students and cover most of the eastern plains and southern part of the state. The remaining districts (with enrollment from 1,000 to less than 10,000, intermediate blues) are scattered throughout the state, but are generally found along interstate corridors or on the southern border.

It should be noted that the two districts in Yuma County on the northeastern border of the state split into four districts in 2001. The Bureau of the Census data used to build these maps does not reflect this change and therefore may not be accurate in all maps shown in this report.

GROWTH IN ENROLLMENT

While districts are diverse in size they are also diverse in their growth. Figure 2 shows enrollment growth in percent by district between 2001 and 2005. Between 2001 and 2005 Colorado's student enrollment grew by 5.8%. However, more than half of the districts (90, green) lost enrollment. Since state education funding is tied to enrollment, shrinking enrollment also means shrinking budgets for school districts. The shrinking districts included the state's largest district (Jefferson County) which lost 800 students over that period and many of the state's smallest districts in the eastern plains and southern part of the state.

Growing districts (blue) are scattered throughout the state, with clusters along the Front Range, along the various interstate corridors, and around Durango and Grand Junction. Many of the fastest growing districts (dark blue) surround Colorado's larger cities, i.e. the exurbs (Forman, 2005): Douglas County (grew by 9,989), Adams 12 (grew by 6,054) and Brighton (grew by 3,875). The three districts with the highest growth rates - Branson, Vilas and Karval - are small districts with their own on-line schools.

Figure 2: Map of Enrollment Growth by District between 2001 and 2005
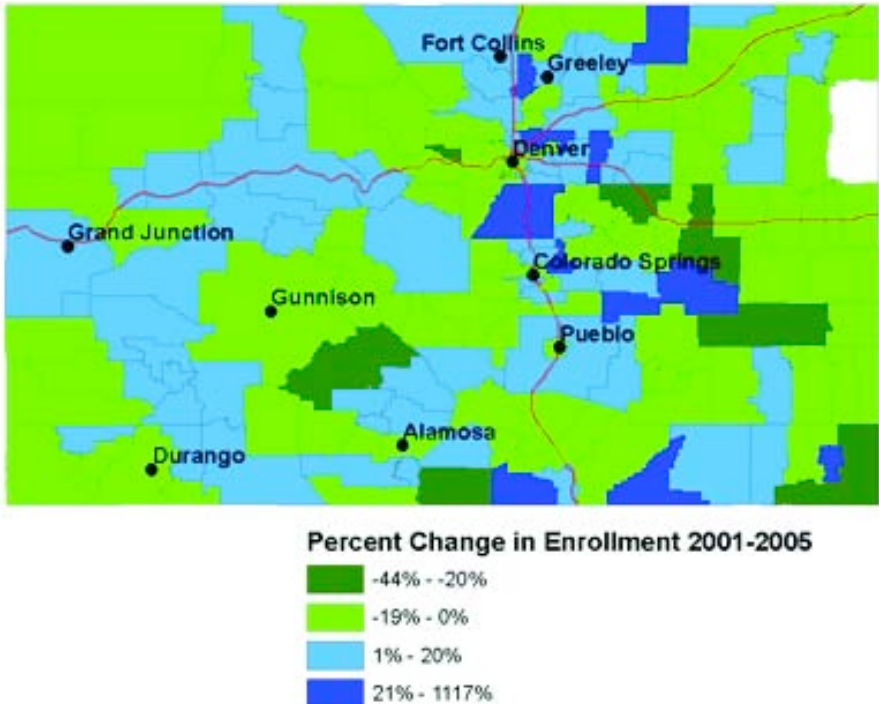
Source: CDE Public Data

STUDENT DEMOGRAPHICS

The demographics of students served in Colorado's districts also vary. Figure 3 shows the proportion of students in a district that are minority.[8] Districts with the fewest minority students are lighter blue; those with more minority students are a darker blue. The various cut points between groups are set by quartiles, i.e. creating four groups with equal numbers of districts. School districts with the most minority students are clustered around Denver, Colorado Springs, Pueblo, the southern third of the state, and along I-70 and I-76. The high minority districts along I-70 are Roaring Fork (43% minority), Eagle County (46% minority) and Lake County (66% minority). The high minority districts along I-76 are Brush (45% minority) and Fort Morgan (55% minority). Most of the minority students in the 43 dark blue districts are Hispanic - with the exceptions of Denver Public Schools and several districts around Colorado Springs, which have larger African American populations; and Montezuma-Cortez (in the southwest), which has a significant Native American population.

Figure 3: Map of Minority Enrollment by District, 2005

Percent of Students who are Minority

- 0% - 11%
- 11% - 22%
- 22% - 37%
- 37% - 94%
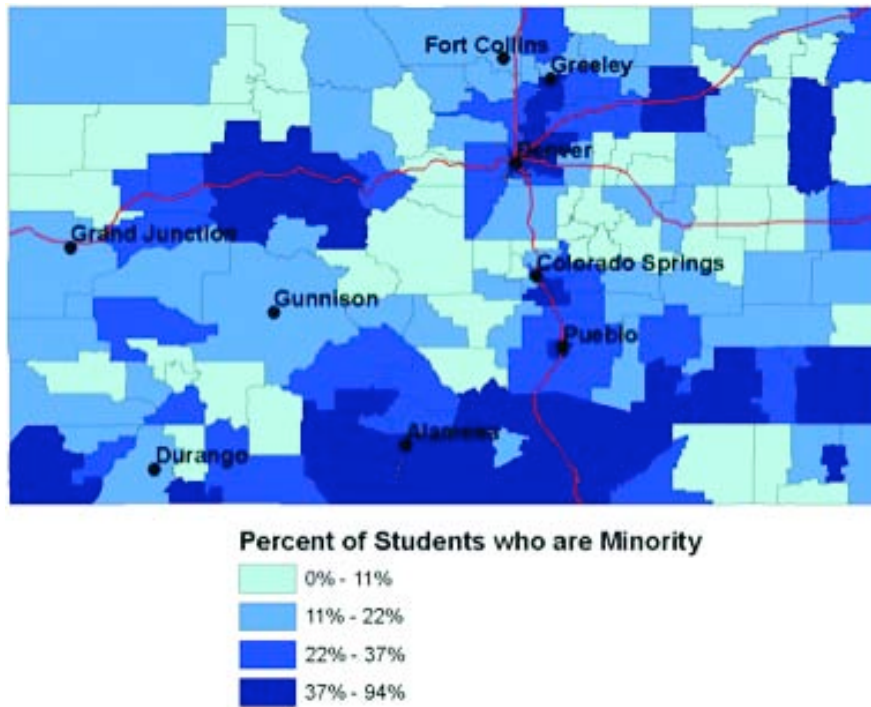
Source: CDE Public Data

[8] Minorities are defined as non-white students, i.e. African American, Asian, Native American and Hispanic in this report.

SUMMARY OF FINDINGS

The demographic information on students at the district level paints a picture of a diverse state with many different working conditions for teachers in terms of district size (student enrollment), district growth, and student characteristics.

Patterns that appear in this chapter:

- The metropolitan areas along the Front Range contain the largest and most racially diverse districts.
- These Front Range districts enroll almost 75% of all students in the state.
- They also include some of the districts with the least minority students.
- These metropolitan districts include - and are bordered by - many of the fastest growing districts in the state.
- Several other areas also have high proportions of minority students: the southern part of the state, particularly the San Luis Valley; as well as the I-70 and I-76 corridors.
- The I-70 and I-76 corridors also have some of the faster growing districts in the state.

(NOTE: Additional information about the diverse educational landscape in terms of poverty and student outcomes is in Appendix A.)

4. TEACHERS IN COLORADO: WHO AND FROM WHERE

If we are to ensure that Colorado's classrooms are staffed by quality teachers, we need to understand the demographics of the current teaching workforce, the sources from which schools and districts recruit/secure teachers, and potential issues with the future supply and demand for teachers. What are the characteristics of the teachers in Colorado? Will we experience a high demand for teachers in the future because of retirements and attrition? How do Colorado teacher salaries compare to other states? This chapter addresses these questions and others about the nature of Colorado's teacher workforce.
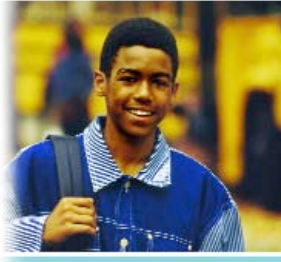
OVERALL TEACHER WORKFORCE

Population

Table 1 provides demographic information about Colorado teachers between 2000 and 2005. The number of public school teachers in Colorado increased during that period from 43,454 to 47,538. Student enrollment rose from 724,508 to 780,708 during the same period. The rate of increase in teachers was slightly faster than that of students as indicated by the reduction in the student/teacher ratio from 16.7 to 16.4. This is similar to national trends where the student/teacher ratio decreased from 17.6 to 16.5 between 1990 and 2003 (NCES, 2006b). Research in Colorado and other states has suggested that increased special education funding is an important factor in the decreasing student/teacher ratio (Rothstein & Miles, 1995).

Table 1: Colorado Teacher Demographics	2000	2005	Change
Number of Teachers	43,454	47,538	4,084
Student Enrollment	724,508	780,708	56,200
Student Teacher Ratio	16.7	16.4	-0.3
Percent Male Teachers	26.0%	26.1%	0.1
Percent Minority Teachers	9.4%	9.6%	0.3

Source: CDE Human Resources data

The proportion of male teachers increased slightly over the past five years (from 26% to 26.1%) as did the percentage of minority teachers. This was due to modest increases in the proportion of Hispanic and Asian teachers and a small decrease in the proportion of Native American teachers. However, the teacher population remains predominately white and female, while the student population continues to become more diverse across the state and in many districts.

Age

Table 2 provides information on the age and retirement eligibility of the teacher workforce. Retirement eligibility is estimated based on age and years of educational service contained in the CDE HR data and retirement rules as found on the Public Employees' Retirement Association web site. Since it is possible for teachers to purchase extra years of experience in the retirement system or transfer experience from other public jobs within the state, these estimates of retirement eligibility should be regarded as a minimum.

Although the information in the table may seem contradictory in that the average age of the workforce declined slightly (from 42.0 to 41.6) and the average years to retirement increased from 12.9 to 13.5, the proportion that are currently able to retire increased slightly from 5.2% to 5.5%.

Table 2: Colorado Teachers & Retirement Eligibility			
	2000	2005	Change
Average Age	42.0	41.6	-0.4
% that are Eligible to Retire	5.2%	5.5%	0.3
Average Years to Retirement	12.9	13.5	0.6
% of Teachers within 5 years of Retirement	30.2%	29.4%	-0.8

Source: CDE HR data
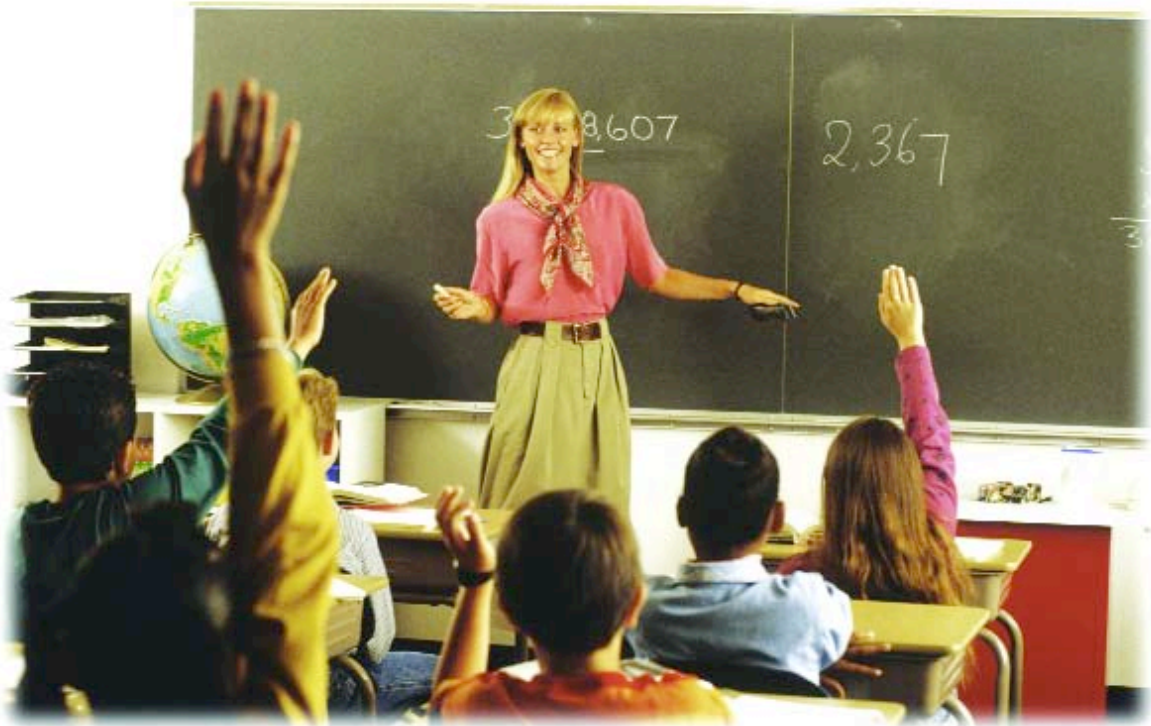
High attrition districts and low attrition districts are scattered throughout the state and in both urban and rural areas.

Examination of the age distribution (Figure 4) of teachers clarifies the reasons for the apparent contradiction in the data. There was an increase in the proportion of younger teachers from 2000 to 2005, as indicated by the large green bulge to the left of the table. At the same time the number of teachers over the age of 55 increased as indicated by the green line overlapping the blue line at age 55. Essentially, the number of older and younger teachers increased, while the number of teachers between 34 and 55 decreased.

While there is a national concern about large number of teacher retirements and how to fill these teaching positions, that problem is not as severe in Colorado as in some neighboring states (e.g. Kansas).[9] This is because as student enrollment has grown over the past 20 years, Colorado districts have been constantly hiring new and mostly young teachers. The end result is that the age distribution of Colorado teachers is relatively uniform compared to some states whose student population has not increased at the same rate. Thus, as illustrated in Figure 4, there will not be as large an ongoing bulge of retirees in Colorado as in other states.

Figure 4: Age Distribution of Colorado Teachers 2000 & 2005
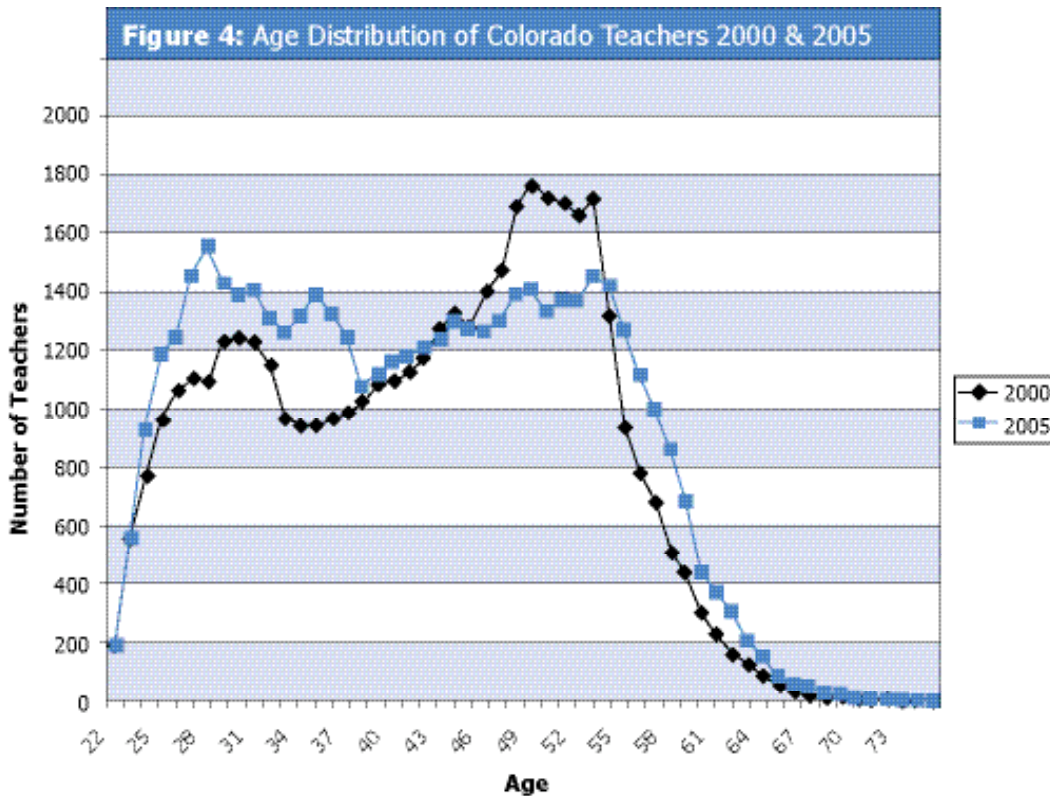
[9] For details on Kansas teachers see Reichardt, 2001a; for enrollment trends see NCES, 2005.

Source: CDE HR data

Attrition

Teacher attrition at the district level is shown in Figure 5. Geographic patterns in teacher attrition are hard to identify. This may be partially due to the fact that this measure is very sensitive in Colorado's many small districts. For example, small districts can have a high attrition rate with a relatively low number of departures. High attrition districts (dark blue) and low attrition districts (light blue) are scattered throughout the state and in both urban and rural areas. There is also a concentration of high attrition districts surrounding Denver.

Figure 5: Map of Teacher Attrition, 2004
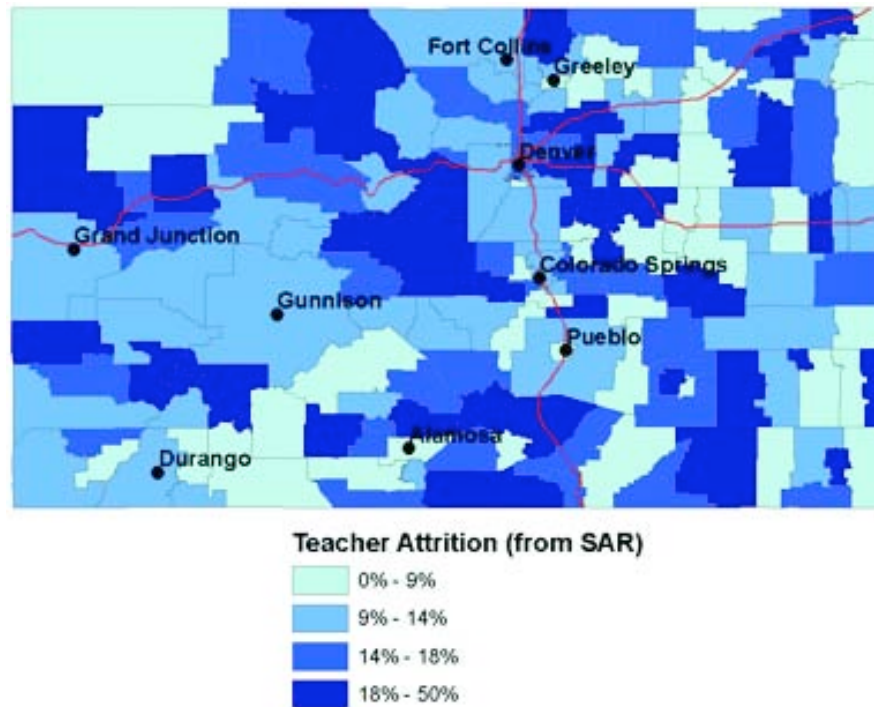
Source: SAR, 2005

COURSES TAUGHT

By using information on the courses taught by teachers, it is possible to derive a teacher's subject area focus[10] and thus understand the overall workforce composition. By relating this to retirement eligibility, we can begin to focus on potential teacher demand challenges. Of course, teacher demand is a more complex issue than is reflected in the retirement data and includes factors such as teacher experience, age, and workplace conditions. Fully exploring those issues is beyond what can be done with the available data and the scope of this report.

[10] The HR data contains information on over 100 different courses in which teachers can provide instruction. These are consolidated into 14 subjects that teachers can teach. The derivation from course to subject area is based on the course numbering scheme as described on the CDE HR data submission web site. Teachers' subject area classifications are based on which topic they spent the most time teaching. If a teacher spent equal time teaching two different subjects, then the teacher was classified as teaching a subject based on core subjects and traditional shortage areas with the following order of priority: math, natural science, foreign language, social sciences, English/Language arts, special education, art, music, career and consumer education, elementary, PE, and pre-school/other.

Table 3 shows Colorado teachers by subject. The fastest growing groups of teachers are special education and English/language arts followed by math and science. The largest group - 39% of all teachers - is elementary teachers. There are also significant numbers of English/language arts teachers (11%) and special education teachers (10%). Table 3 also shows the proportion of teachers who are white, their mean age, percent eligible to retire in 5 years, and the change in the percent eligible to retire from 2000 to 2005. The subject with the lowest proportion of white teachers is foreign language, due to a large proportion of Hispanic foreign language teachers (20%).

Table 3: Colorado Teachers by Subject, 2005

	Percent of Total	Change in Percent of Total from 2000	White	Mean Age	Eligible to Retire in 5 Years	Change From 2000 in Eligible to Retire
Art	3%	0%	94%	43.0	36%	3.8
Career, Technical, Family Consumer, & Agriculture	5%	0%	93%	44.3	36%	0.3
English/Language Arts	11%	2%	91%	41.3	30%	-3.2
Foreign Language	3%	0%	78%	42.1	32%	-2.6
General Elementary	39%	0%	89%	41.2	29%	-1.9
Math	7%	1%	91%	41.0	26%	-3.2
Music	4%	0%	92%	41.8	31%	4.9
Natural Science	6%	1%	93%	40.1	22%	-4.0
PE	5%	0%	89%	41.0	24%	-3.4
Social Sciences	6%	0%	90%	39.9	23%	-5.9
Special Education	10%	2%	93%	43.8	38%	6.6
Pre-school/Other	2%	-7%	90%	43.4	35%	8.0
Total	47,538 (101%*)		90%	41.6	29%	-0.1

*Due to rounding, total does not equal 100%

Source: CDE HR data

While there was little change in the overall proportion of teachers eligible to retire, there were significant differences between subjects. Most notable was the large increase in the proportion of pre-school, special education, music, art and the combination of career, technical and consumer education teachers that are eligible to retire within five years. Over a third of the teachers in these disciplines will be eligible to retire in the near future (about 31% for music) and this raises concerns over the future supply of teachers in these subject areas.

Finally, the exact reason for the large change in percent of teachers eligible to retire in Pre-school/Other is difficult to pin down. The number of teachers in this category decreased greatly over the four-year period (from 9% of the total workforce to 2%, probably due to "Highly Qualified" requirements of NCLB) making interpretation of the change in retirement eligibility difficult.

Precise determinations of teacher shortages are important for ensuring that there is a quality teacher available for every Colorado classroom. However, the data available for this report do not allow firm calculations of teacher supply and demand because teacher attrition, mobility, and supply cannot be precisely determined. However, teacher shortage areas in Colorado were estimated in 2003 using licensure data. These shortages were generally location and subject specific. Districts in the northwest and southeast portion of the state, as well as urban districts, appeared to face teacher shortages in foreign language, special education, math, and natural science (Reichardt, 2003).

Demand for teachers in English, foreign language, social science, natural science and math may grow as districts work to prepare their students for the new entrance requirements in Colorado's public colleges and universities (CCHE, 2005).

ROUTES TO TEACHING

There are three primary routes to enter the teaching profession in Colorado:[11]
- In-state college/university programs
- Colorado alternative programs
- Out-of-state college/university programs

Through these routes, the state's regulatory system sets minimum standards for what a teacher in Colorado must know and be able to do. For more information on routes to teaching in Colorado see Appendix B.

Table 4 shows the number of new teachers in 2005 (i.e. had no teaching experience) by subject, and whether they received their highest degree in Colorado or another state. Where people received their highest degree is expected to be similar to where people received their teacher preparation, but is not an exact measure. Over half (58%) of new teachers received their highest degrees in Colorado. Foreign language is the subject with the most teachers receiving their highest education from other states (56%). Subjects with the least are elementary (36%) and social science (38%).

[11] **Data Note:** There is not one definitive source of data on the three teacher pipelines in Colorado. Instead, there are several, not well aligned, datasets that provide incomplete information. First, Colorado Department of Education (CDE) Human Resources (HR) data contain information on where people received their highest degree. This is not necessarily the same as where people received their teacher preparation, but it gives information on higher education training in Colorado or out of state. A second set of data was provided by the CDE Licensure Unit. They provided data on all licensed teachers (not including approximately 4% of all teachers with authorizations (e.g. emergency or alternative) in combination with the HR data. This licensure data contains information on where working teachers received their preparation. Up to 26% of the records in the licensure set did not have data on where people received their preparation - either because they have an authorization (instead of a license) or because no information was entered in that field. Two other sources of information are the Colorado Commission on Higher Education (CCHE) and the CDE Alternative Programs Unit (part of Educator Licensing) which provide enrollment information for both Colorado teacher preparation programs.

Table 4: New Teachers by Subject & Location of Higher Education, 2005

	Percent of Total	Highest Degree From Colorado	Highest Degree From Out of State
Art	3%	57%	43%
Career, Technical & Consumer	5%	55%	45%
Elementary	38%	64%	36%
English/Language Arts	11%	55%	45%
Foreign Language	3%	44%	56%
Math	9%	53%	47%
Music	4%	47%	53%
Natural Science	6%	53%	47%
PE	3%	57%	43%
Pre-school/Other	0%	59%	41%
Social Sciences	6%	63%	38%
Special Education	11%	56%	44%
Total	**2,844** (99%)*	**58%**	**42%**

*Due to rounding, total does not equal 100%

Source: CDE HR data

Table 5 uses licensure data to show whether teachers received their preparation in Colorado or another state for three groups of teachers: all licensed teachers, those that are new to teaching in Colorado (including those with out-of-state experience) and those new to teaching.

Table 5: Sources of Teacher Preparation, 2004

	All Teachers	New to Colorado Teaching	New to Teaching
Prepared in Colorado	51%	39%	48%
Prepared out of Colorado	34%	39%	27%
No Data	15%	22%	26%
Total	46,789 (100%)	3,890 (100%)	3,170 (101%)

*Due to rounding, total does not equal 100%

Source: CDE HR & Licensure data

As shown in Table 5, of all teachers working in Colorado, no less than 51% were prepared in Colorado. For teachers new to the profession in Colorado, the data show that half of those for whom information was provided were prepared in Colorado. A much greater percentage of teachers new to the profession entirely were prepared in Colorado (48%) than not (27%). Taken together, the data suggest that districts will hire an out-of-state experienced teacher over a Colorado-prepared teacher with no experience, which is consistent with the clear evidence that first year teachers are not as effective as experienced teachers. When hiring a teacher with no experience, however, districts are more likely to choose teachers prepared in Colorado.

It is important to note that districts fill vacancies with both experienced teachers and new teachers, i.e. teachers with no experience. Earlier work with Colorado found that 44% of teachers hired by districts were new teachers (Reichardt, 2003). Therefore, the measures of demand in Table 5 - new teachers and new to Colorado teaching - do not measure all teachers hired. Neither do they measure all the positions districts would fill if there were quality applicants.

Teachers Prepared in Colorado

Table 6 shows the most recent data available on students in Colorado's 19 traditional and 40 alternative[12] teacher preparation programs by subject (CCHE, 2006, & data provided by CDE). These data are for fiscal year 2004-05; enrollment in a program is determined by at least one term of study during the year. A key difference is that those students in alternative programs are already working as teachers. Those in traditional programs were not yet practicing teachers and many chose not to seek jobs in teaching.

Table 6: Traditional & Alternative Teacher Preparation Program Enrollment by Subject, 2004	Number in Traditional Programs	Number in Alternative Programs	Total in State	Percent of Enrollment
Art	283	14	297	3%
Career, Technical & Consumer	446	40	486	5%
Elementary	3,589	140	3,729	38%
English/Language Arts	1,578	70	1,648	17%
Foreign Language	152	37	189	2%
Math	287	94	381	4%
Music	196	16	212	2%
PE & Health	286	62	348	4%
Science	385	13	398	4%
Social Studies	720	30	750	8%
Special Education	1,009	46	1,055	11%
Pre-School	239	26	265	3%
Total	9,170	588	9,758	

Source: CCHE & CDE Alternative Programs Unit, 2006

[12] Includes both Alternative Licensing Program (ALP) and Teacher in Residence (TiR).

The enrollment subject areas shown in Table 6 were created to match the taught subject areas in Table 4. Since these are from different data sources they do not provide exact 1-to-1 comparisons. The areas with the most questionable match are English/language arts and Pre-School/Other.

Enrollment by subject in preparation programs (Table 6) closely matches the percentage of teachers in the three subject areas with the most teachers (Table 4): elementary (38% of enrollment and teachers) and special education (11% of enrollment and 11% of teachers) followed by English (17% of enrollment and 11% of teachers). The largest discrepancy is in the area of math where 9% of teachers report math as their main assignment while only 4% of enrolled preparation students are studying math.

Alternative programs produce a significant number of the new teachers prepared in Colorado. In 2004-05, about 3,200 new teachers were hired (Table 5). Based on the above data, about half (1,600) of those were prepared in Colorado. At the same time, Colorado's alternative programs produced about 550 new teachers. Therefore, about 35% of the new teachers in 2004-05 were in Colorado's alternative programs. Colorado's higher education (traditional) programs produced the remaining 1,150 teachers prepared in Colorado, about a third of all new teachers hired in Colorado. This is similar to previous AQT estimates (Bassett, et al. 2003). Since the publication of that AQT report, the number of teachers produced yearly by alternative routes has declined from about 740 to about 550.[13]

Finally, Table 7 shows the institutions where new teachers were prepared and/or received their highest degree in Colorado.[14] The largest proportion was prepared at the University of Northern Colorado (UNC) with an equal percentage (27%) of those prepared in and received their highest degrees in Colorado. After UNC, the data on where people received their highest degree and where people were prepared diverges a bit. For example, Colorado State University provides the highest degree to 13% of new teachers but prepared only 8% of the new teachers.

Table 7: Top 5 In-State Universities Attended by New Teachers, 2004

	Highest Degree (Based on HR Data)	Where Prepared (Based on Licensure Data)
University of Northern Colorado	27%	27%
Colorado State University	13%	8%
Metropolitan State College	10%	13%
University of Colorado at Boulder	11%	6%
University of Colorado at Denver	4%	8%

Source: CDE HR & Licensure data

[13] The fact that some teachers exit programs before completion and that some programs may be producing teachers for public and private schools makes the numbers reported here close approximations.
[14] In this analysis the licensure data is limited to those with data on where they were prepared. This essentially assumes that those without data were equally distributed among preparation institutions as those with data provided.

The data presented suggest that about half of all new teacher positions are filled with teachers prepared in Colorado. While the data are not complete, they suggest that there is general alignment between Colorado traditional preparation programs and subject area demand. The one exception may be mathematics which has relatively low enrollment in Colorado traditional preparation programs. Recent changes in admission requirements to Colorado colleges and universities may also affect the demand for English, foreign language, social science, natural science, and math teachers.[15]

It should be pointed out that even with nearly half of new teachers prepared in Colorado, this group of teachers represents just over 3% of the total teaching force in Colorado. This has implications on the impact of reforms in teacher preparation: as a single reform effort, changes to Colorado teacher preparation programs would take an extended period of time to impact a large number of students.

Teachers Prepared in Other States

When looking at those who received their highest degree from another state, many were from the larger states, i.e. California, Texas, Illinois, Michigan, and New York (Table 8). However, neighboring states, i.e. Nebraska and Arizona, are also important sources of new teachers. Table 8 is similar to Table 7 in that it shows both where people received their highest degrees and, for those with data, where they were prepared.[16] Again there are some differences between the preparation and licensure data, but the differences for those prepared out-of-state are not as great as for those prepared in Colorado.

Table 8: Top Out of State Sources of New Teachers, 2004	Prepared Outside of Colorado	Highest Degree Outside of Colorado
California	7%	8%
Michigan	6%	5%
Texas	6%	6%
Illinois	6%	5%
Iowa	5%	5%
Arizona	5%	4%
New York	5%	5%
Wisconsin	5%	4%
Nebraska	5%	3%
Ohio	5%	4%

Source: CDE HR & Licensure data

[15] The Colorado Commission on Higher Education (CCHE) adopted revised admission standards in October 2003. These standards include course completion requirements for high school graduates entering Colorado four-year public institutions, beginning in Spring 2008. Phase II of the requirements begin in spring 2010. For details, see the CCHE Admissions Standards Policy, Pre-Collegiate Course Completion Addition, updated 2/2/06 - http://www.state.co.us/cche/academic/admissions/index.pdf

[16] As with table 7, the preparation data is limited to those with data on where people were prepared. Again, this essentially assumes that those without data were equally distributed among states as those with data.

Average salaries within the state are generally lower in the eastern plains and to a lesser extent, the central and southern part of the state. Districts with higher average salaries are in the Front Range metropolitan areas, along the western I-70 corridor and the northwest.

TEACHER SALARIES

A description of the workforce would not be complete without a discussion of teacher salaries. Teacher salaries are an important focus of policymaker attention since they reflect strategic decisions (or lack of decisions) about how to invest a district's money. Salaries can also affect a school's and district's ability to attract and retain quality teachers.

The data in this section were garnered from information on average salaries provided by the state at the district level in the annual School Accountability Reports (SAR). The data in Figure 6 show the average salaries for teachers in 2004. The lowest salaries are in light blue and the higher salaries are in dark blue; the grouping breaks are by quartile.

Average salaries within the state are generally lower in the eastern plains and to a lesser extent, the central and southern part of the state. Districts with higher average salaries are in the Front Range metropolitan areas, along the western I-70 corridor and the northwest.
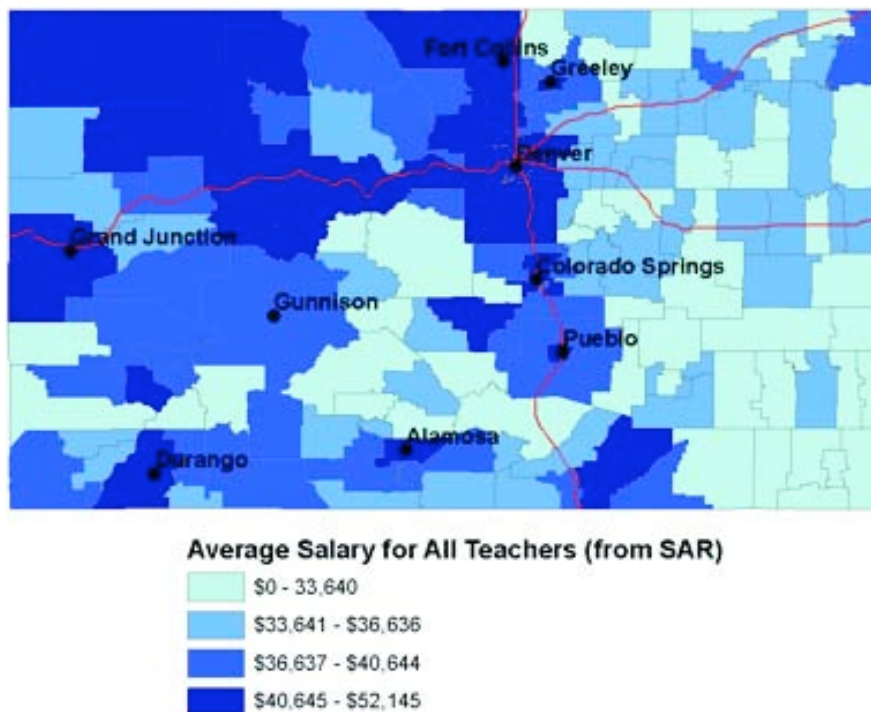
Figure 6: Average Teacher Salaries 2004

Average Salary for All Teachers (from SAR)

	$0 - 33,640
	$33,641 - $36,636
	$36,637 - $40,644
	$40,645 - $52,145

Source: SAR 2005

The lower average salaries are correlated with both smaller student-teacher ratios and lower enrollments (Figure 7). That is, those districts with higher student-teacher ratios tend to have a higher average salary than those where the ratio is smaller. Further, those districts with smaller enrollments tend to have lower average salaries.

The scatter plot in Figure 7 depicts average salary on the Y-axis and the student-teacher ratio on the X-axis; each dot represents a district. The upward sloping line shows the average relationship between salary and student-teacher ratio. The slope of the line suggests that, on average in 2004, for every increase of 1 in student/teacher ratio, the average salary in a district went up by $944.[17]

There are at least two explanations for this relationship. First, some districts may hire more teachers at lower salaries due to the lack of highly skilled teachers in some rural areas. Another potential explanation is that small schools and small districts may have smaller class sizes due to fewer students in each grade, forcing these districts to offer lower salaries in order to fund enough teachers. It is entirely possible that both of these factors are at work in the low salary districts.

Figure 7: Scatter Plot of District Level Student-Teacher Ratio to Average Salary, 2004
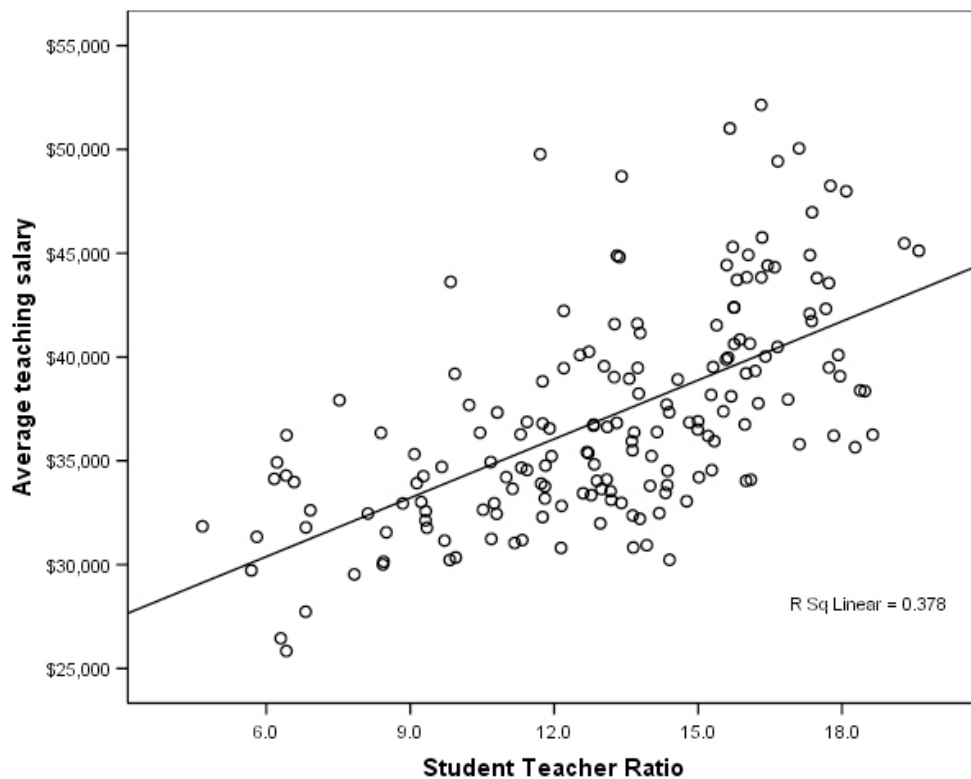
Source: SAR 2005

[17] This slope estimate is from a linear regression of average salary on student-teacher ratio. The r-squared of that regression was .378, with a standard error of 92.715 and a .000 significance level.

How do Colorado teacher salaries compare nationally and with other states? The average teacher salary in Colorado in 2003 at $43,318 was slightly lower than the nation's average (Table 9). However, to the extent that salary is an important tool for attracting teachers from other states, a key issue is how Colorado salaries and cost of living compare to neighboring states and to those states that provide many teachers.

Colorado teacher salaries were higher than all of its neighboring states but lower than those states that are the source of higher education for many of Colorado's teachers. Colorado's cost of living is higher than most of its neighboring states and lower than many (except Texas) of the states that are the primary sources of new teachers.[18] Taken together, this suggests that higher salaries were not the primary driver for teachers to relocate to Colorado.

Table 9: Average Teacher Salaries by State, 2003

State	Average Salary	Beginning Salary	Cost of Living
Colorado	$43,318	$31,296	97.4
Neighboring States			
Arizona	$42,324	$28,236	103.5
Kansas	$38,622	$28,530	92.5
Nebraska	$39,635	$28,527	88.6
New Mexico	$38,469	$31,920	99.2
Oklahoma	$35,061	$29,473	88.2
Utah	$38,976	$26,130	95.0
Wyoming	$39,537	$28,900	103.2
Largest Sources of Out of State Teachers			
California	$56,444	$35,135	140.1
Texas	$40,476	$32,741	89.4
Illinois	$53,820	$35,114	97.5
Michigan	$54,474	$34,377	99.0
New York	$55,181	$36,400	126.9
US National Average	$46,597	$31,704	100.0

Source: AFT, 2005; MERIC, 2005

[18] The cost of living index used in this table was derived by the Missouri Economic Research and Information Center (MERIC) using information from the Council for Community and Economic Research (ACCRA) cost of living city surveys. ACCRA's index measures relative cost of goods and services in participating metropolitan areas, with the average being 100. MERIC determined the state cost of living index by averaging the indices of all participating metropolitan areas in that state.

SUMMARY OF FINDINGS

Overall Workforce

- Between 2000 and 2005, the rate of increase in teachers was slightly higher than that of students.
- The proportion of male teachers increased slightly from 26% to 26.1%.
- There was a slight increase in minority teachers from 9.4% to 9.6%.
- Although there is a national concern about teacher retirements, it appears that the rate of teacher retirement in Colorado will not increase in the future.
- The fastest growing groups of teachers are special education and English/language arts, perhaps pointing to the increased emphasis on literacy needs.
- The data available for this report do not allow firm calculations of current or future teacher demand.

Routes to Teaching

- There is not one definitive source of data on the three teacher pipelines in Colorado.
- About half of all new teachers in Colorado are prepared in Colorado.
- Foreign language is the subject with the most teachers prepared outside of the state.
- Elementary and social sciences are the subjects with the most teachers prepared in Colorado.
- Districts hire experienced out-of-state teachers over a Colorado-prepared teacher with no experience.
- When hiring teachers with no experience, districts choose more teachers prepared in Colorado.
- The future supply of Colorado prepared teachers in the subjects with the largest number of teachers (elementary, English and special education) matches the current employment patterns.
- Math is the subject where the supply from Colorado preparation institutions may not be adequate.

Salaries

- Average teacher salaries were generally lower in the eastern plains and, to a lesser extent, the central and southern part of the state.
- The higher teacher salaries were in the Front Range metropolitan areas, along the western I-70 corridor and the northwest.
- On average in 2004, for every increase of 1 in student-teacher ratio, the average salary in a district went up by $944.
- Average teachers' salaries in Colorado in 2003 at $43,318 were slightly lower than the nation's average.
- Colorado salaries were higher than all of its neighboring states but lower than those states that are the largest source of Colorado's teachers prepared in other states.

QUESTIONS RAISED FROM THE FINDINGS

While Colorado has three main sources of teachers, information is not available on the quality of teachers from those sources or the changes in policy needed to meet the demand for quality teachers. This raises some critical questions for investigation that include:

- What are the sources of Colorado's best teachers?
- What can be learned from those sources to improve all of Colorado's preparation programs?
- What are the sources of Colorado teachers that are not meeting the needs for high quality teachers?
- Is our system of determining who becomes a teacher in Colorado (licensure) meeting the state's needs?
- What are the programs and practices at the district level that help attract, hire and support high-quality teachers?
- Do the changes in student demographics require additional diversity in the teacher workforce?
- If so, is this need being met by the supply?

5. IS THERE A TEACHER GAP?

The central issue around teacher quality is whether qualified teachers are distributed equitably within a district and the state. It is unfortunately clear on a national level that poor and minority students are often assigned the least qualified teachers. This issue is often called the "teacher gap". For example, research in North Carolina found that the probability that an African American student has a less qualified teacher in her first two years of teaching is 4.5 percentage points higher than that for whites. The same research also found that the concentration of inexperienced teachers was both a state and a district issue. That is, districts with more African American students had more inexperienced teachers and schools with more African American students within those districts had more inexperienced teachers (Clotfelter et al., 2004; also see National Partnership for Teaching in At-Risk Schools, 2005). As teacher quality is a critical factor for student learning, an inequitable distribution of qualified teachers is clearly related to differences in student achievement (Peske et al., 2006).

Earlier research in Colorado has confirmed this is also a problem in Colorado. That research showed that qualified teachers are not evenly distributed among Colorado schools. For example, 31% of the teachers had two or fewer years of experience in high poverty schools compared to 22% of the teachers in low poverty schools in 2001 (Reichardt, 2003).

Measures of Qualifications Used In This Chapter

Since Colorado does not have a direct measure of teacher quality (such as value-added), teacher qualifications are used as a proxy for teacher quality. Establishing qualification indicators is necessary in order to examine the equity of teacher placement across Colorado. The earlier Colorado research, and the research provided in this report, uses several measures of teacher qualifications and their relationship to student poverty and race at the school level. In this chapter, multiple measures of qualifications are used based on the available data. The placement of teachers based on their qualifications will be examined and correlated with student race and poverty; salary expenditures will be correlated with race and poverty; and information from the earlier research will be updated in order to provide further evidence that the teacher gap is an important component of the achievement gap in Colorado.

The first measure is teacher experience. Novice teachers are defined as those with two or fewer years of experience as compared to experienced teachers with three or more years of experience. Based on existing research, this measure is expected to be closely linked to student learning (King, 2003, Reichardt, 2001).

A second measure is education: Bachelor's degree only teachers are contrasted with teachers with a master's degree or higher. The links between this indicator and student learning are much weaker than teachers' years of experience. However, educational attainment is a traditional indicator of teacher quality that is often tied to teacher compensation. In this report, teachers will be described as less qualified if they are either novices or have a bachelor's degree (BA) only. More qualified teachers are those with three or more years of experience or a master's degree or higher.

Three other measures of teacher quality characteristics are used here. First is teacher attrition, which is believed to be related to a school's ability to build and nurture a quality workforce (Ingersoll, 2001). A second measure is teacher salaries. Teacher salaries are a complex measure that capture both teacher experience and education level, and may or may not be directly related to teacher quality. However, teacher salaries definitely reflect districts' decisions (or lack of decisions) about how to use and allocate resources to schools (Miller et al., 2004). Finally, the distribution of "Highly Qualified" teachers as defined under the federal No Child Left Behind (NCLB) law will be examined. While it may be reasonable to assume that "Highly Qualified" teachers can better support student learning, this assumption has not yet been tested by research.

These teacher qualification measures should be used as indicators of teacher quality with some caution. While attrition and salaries have been associated with student learning using large datasets, they provide limited information on individual teachers. More importantly, all available indicators of teacher quality (experience, education, assessment scores, degree major, college selectivity, etc.) taken together account for, at most, 10% of the differences between high and low quality teachers. In other words, we can only measure some of the things that make teachers good (Goldhaber, 2002). Thus, while we know teacher quality is important, it is not easy to identify quality teachers with the measures we currently have. The creation of a unique teacher identifier that allows for teacher value-added data would greatly increase the available information on teacher quality.

The distribution of these teacher qualifications throughout Colorado can be mapped. Figure 8 shows the proportion of bachelor's degree only teachers, at the district level, in Colorado for 2005. The districts are grouped in quartiles. Districts with higher concentrations of bachelor's degree only teachers (74% to 93%) were often located on the eastern plains. At the same time, districts with few bachelor's degree only teachers were scattered throughout the Front Range, mountains and western slope.

Figure 8: Map of Teachers with a Bachelor's Degree Only, 2005
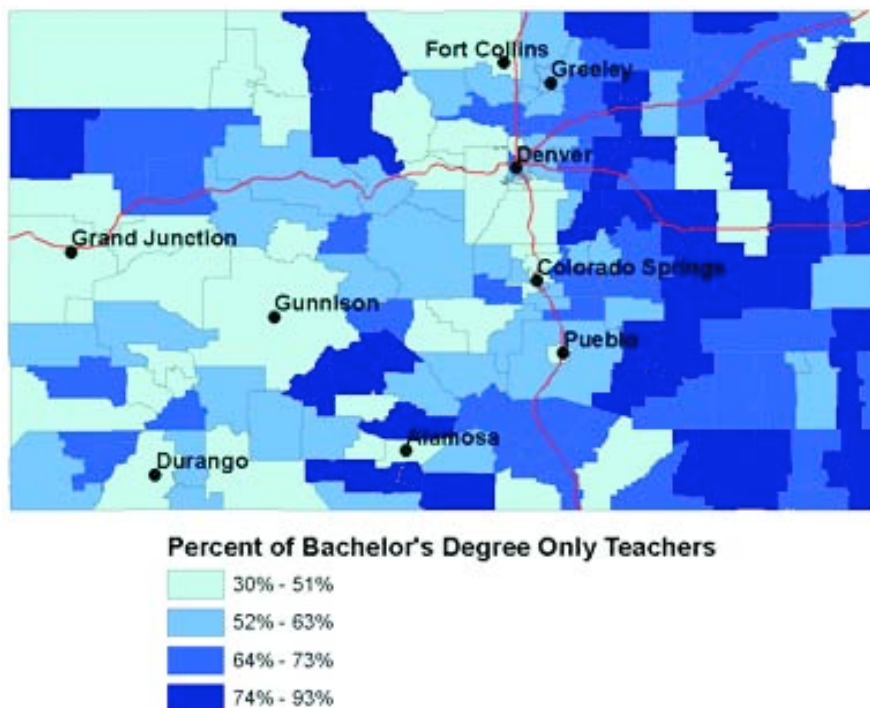
Source: CDE HR data

Figure 9 shows the distribution of novice teachers throughout the state. Those districts with high proportions of novice teachers (dark blue) are largely concentrated in districts adjacent to the cities along the Front Range. These outer ring districts include some of the fastest growing districts (See Figure 2). They also may be serving as feeder districts for metropolitan and suburban districts, i.e. new teachers may be working and gaining experience and then transferring into the suburban or urban districts when opportunities arise.

Figure 9: Map of Novice Teachers, 2005
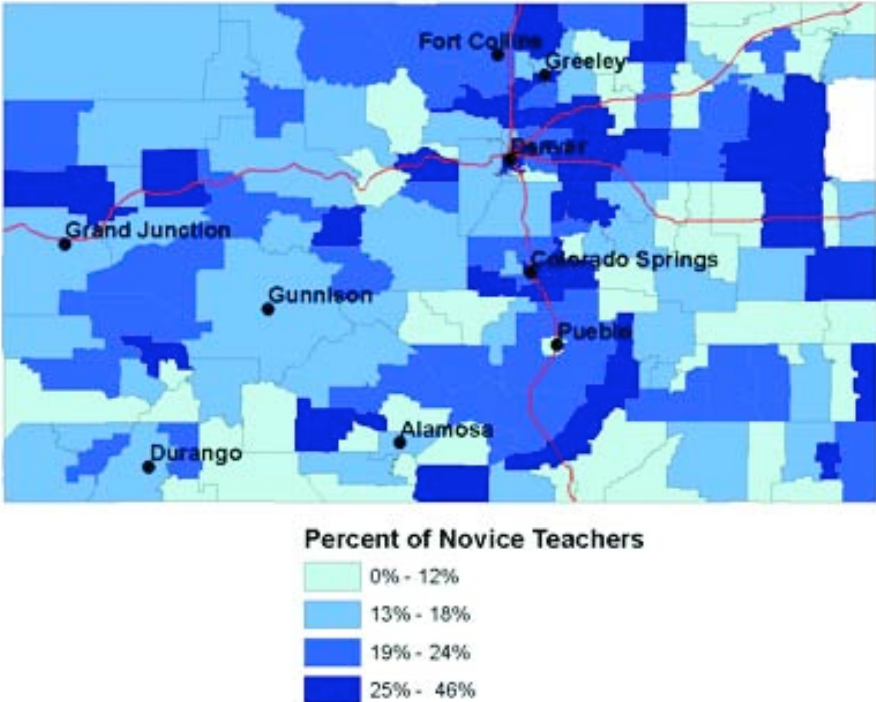
Source: CDE HR data

TEACHER QUALIFICATIONS AND STUDENT PERFORMANCE

Teacher qualification measures are correlated with student performance. Figure 10 shows the relationship between the teacher quality measures and average math ACT score at the school level. Colorado's high schools (not including alternative) are broken into quartiles by their average score on the math section of the ACT. As average ACT scores go down (from left to right in Figure 10) the proportion of novice and bachelor's degree only teachers increased. The relationship is not completely linear for the bachelor's degree only category. The proportion of bachelor's degree only teachers is higher in the second grouping (57%) than the third (56%). The differences are more linear for novice teachers, where the proportion of novice teachers is 7 percentage points higher in the lower scoring schools than in the highest scoring schools.

Figure 10: Teacher Qualifications by Average Math ACT Score, 2004
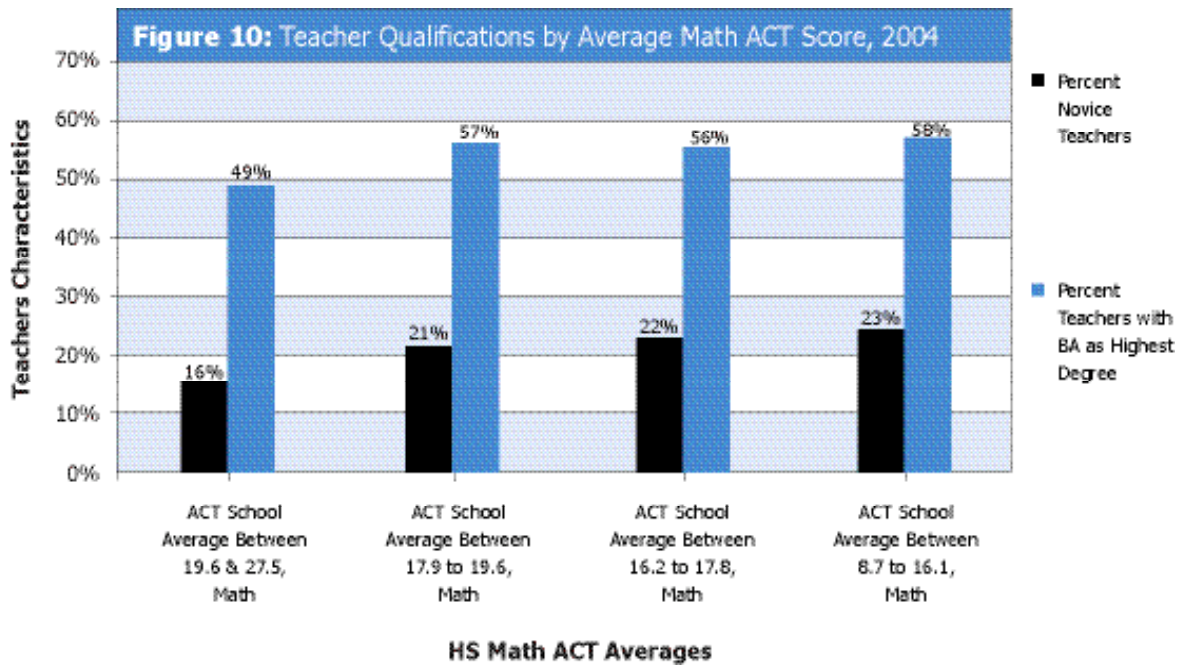
Source: SAR 2005 and CDE HR data

Figure 11 shows the same relationship as Figure 10 but using proportion of proficient and advanced students on the math section of the CSAP instead of ACT scores. The highest scoring schools are on the left and these schools have the fewest novice and bachelor's degree only teachers (15% and 50% respectively). The proportion of less qualified teachers increases as scores decrease for both of these measures of teacher qualifications.

Figure 11: Teacher Qualifications by Proportion of Students Proficient and Advanced on the Math Section of the CSAP, 2004
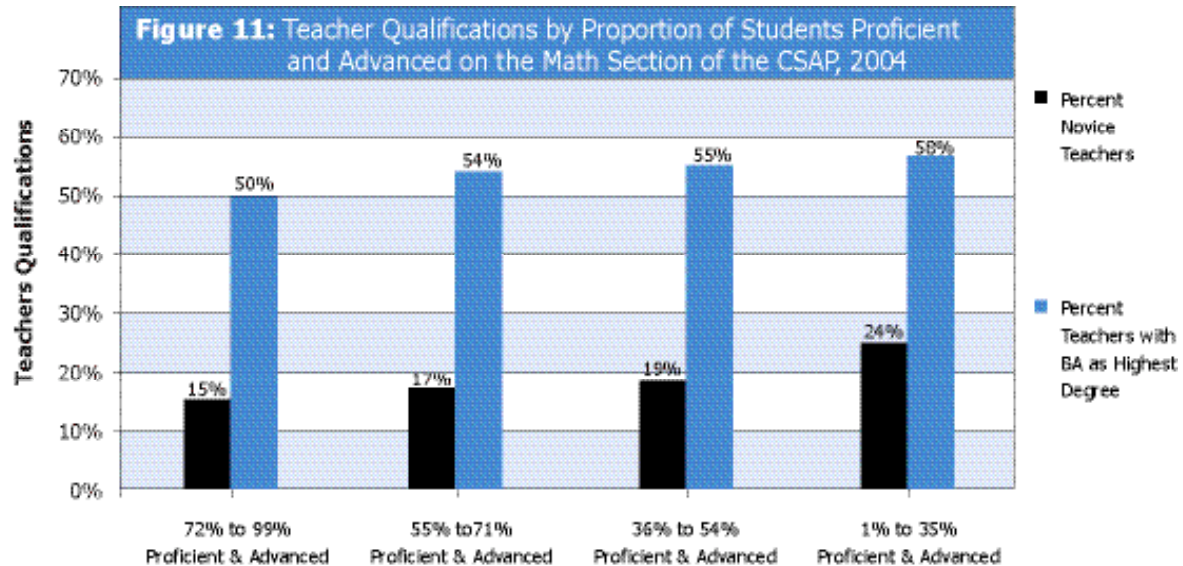
Schools Grouped by Proficient & Advanced Students on Math CSAP

Source: SAR 2005 and CDE HR data

Taken together we see a correlation between student performance and teacher qualifications at the school level in Colorado. Lower performing students in Colorado have less qualified teachers. This does not mean that less qualified teachers are causing students to have lower scores. Instead, it suggests that the concentration of less qualified teachers in a school correlates with student performance and requires further investigation into the causes and other related factors.

SCHOOL LEVEL MEASURES OF THE TEACHER GAP

With the central issue being whether qualified teachers are distributed equitably within a district and the state, this distribution is described in several ways at both the school and district level. The first examines the teachers working in schools by the proportion of students that are minorities or eligible for free and reduced lunch (FRL). Second, teacher attrition at high and low poverty as well as minority schools is examined. The third analysis examines whether minorities and FRL students are more likely to be served by less qualified teachers at the district level. Finally, district expenditures on teacher salaries at the school level are described. The school level analysis includes all schools in the state while the district level analysis focuses on the largest 20 districts in the state that serve 75% of all students.

For the school level analysis, schools are classified into four groups each with 25 percentage point spans. For example, minority status schools are grouped as having 0% to 25% minority, 25.1% to 50% minority, 50.1% to 75% minority and 75.1% to 100% minority. Table 10 shows the number of schools in the analysis groupings. There are several important points.

- The number of schools in each grouping declined as the proportion of minority or FRL students increased. The comparisons are between a few schools with large proportions of minority or FRL students and many schools with few minority or FRL students.
- The proportion of minorities increased and became more concentrated over this period. The number of schools increased from 2000 to 2005 by approximately 140 schools. However, even though the number of schools increased, the number of schools with the fewest minority and FRL students declined. At the same time, the greatest increase in the number of schools occurred in the grouping with the most minority or FRL students. Statewide, the proportion of minorities increased from 32% to 37% and FRL students from 27% to 34% over this period.
- The number of schools in the two groupings, minority and FRL, are different by about 20 schools. These 20 schools are mostly pre-schools with no reported FRL counts.

Table 10: Number of Schools Per Analysis Group

FRL Groupings	2000 Schools	2005 Schools	Minority Groupings	2000 Schools	2005 Schools
0 to 25% FRL	712	605	0% to 25% Minority	869	779
25% to 50% FRL	469	505	25.1% to 50% Minority	347	427
50% to 75% FRL	262	355	50.1% to 75% Minority	216	270
75% to 100% FRL	99	203	75.1% to 100% Minority	130	227
Total	1,542	1,668	Total	1,562	1,703

Source: CDE publicly available enrollment and FRL data

Teacher Qualifications and Student Race/Poverty

Figure 12 shows the proportion of novice teachers by schools grouped by minority (non-white) students for both 2000 and 2005. This figure shows several important trends that are consistent throughout the data. First, the proportion of teachers with low qualifications increased as minority students increased. Schools in 2000 with the fewest minority students (0% to 25%) had the fewest teachers with low qualifications (21% novices in 2000 and 17% novices in 2005). The percentage of novice teachers in schools with a relatively high minority enrollment is much greater (27% in 2005) than in schools with a lower percentage of minority students (17% in 2005).

Second, the difference in teacher qualifications stayed the same or increased between the schools with the fewest and most minority students between 2000 and 2005. Here the difference between the schools with the fewest and most minority students increased from 5 percentage points in 2000 (i.e., 26% - 21% = 5 percentage points) to 10 in 2005. This means that distribution of qualified teachers became less equitable over this period. Not only is there a gap, but the gap is widening. Finally, the overall proportion of novice teachers declined between 2000 and 2005 from 22% to 20%.

Figure 12: Novice Teachers by Proportion of Minority Students, 2000 & 2005

Schools Categorized by Percent Minority
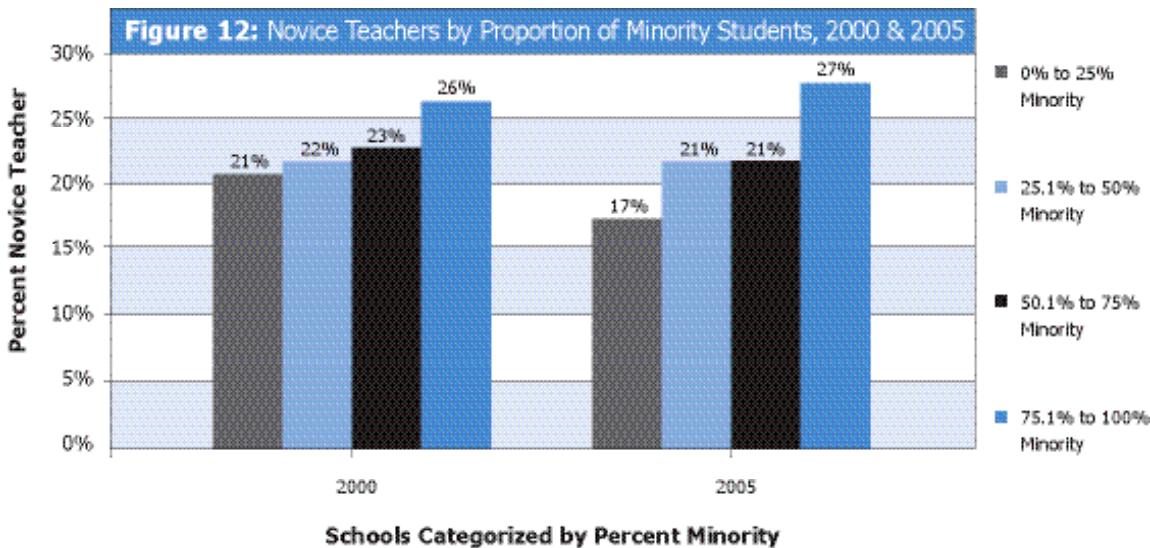
Source: CDE HR & publicly available enrollment data

A similar pattern exists for teacher education (teachers with a bachelor's degree only vs. holding a master's or higher). In Figure 13 schools are categorized by proportion of FRL students. The measure is proportion of bachelor's degree only teachers. The patterns are clear here as well, with decreases in teacher qualifications as the proportion of FRL students increase, and increases in the disparity in teacher qualifications between high and low poverty schools since 2000. In addition, while there was also a general improvement in teacher education level since 2000 with the proportion of bachelor's degree only teachers declining from 58% to 52% statewide, the difference in this teacher qualification between high and low poverty schools was 4 percentage points in 2000 (i.e. 62% - 55% = 7 percentage points), increasing to 11 percentage points in 2005.

Source: CDE HR & publicly available FRL data

Figure 13: Bachelor's Degree Only Teachers by Proportion of FRL Students 2000 & 2004

Schools by Percent Free & Reduced Lunch Eligible
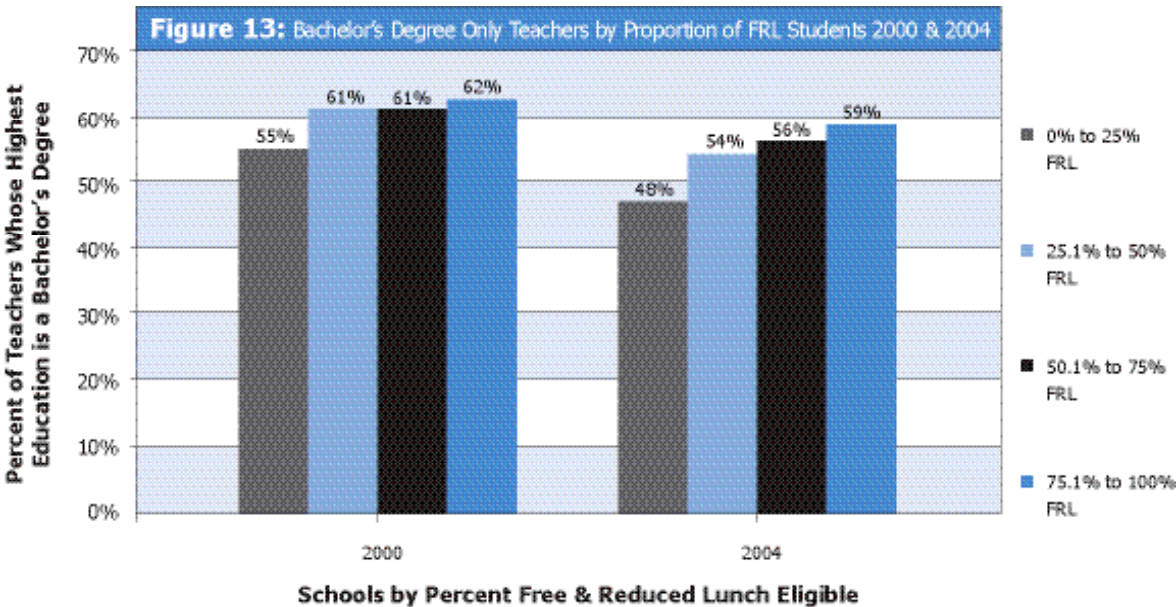
While not shown here, the patterns for minority students and novice teachers as well as for bachelor's degree only teachers and FRL students are also evident in the other possible combinations of this data.

Not only is there a teacher gap, but the gap is widening.

Placement of "Highly Qualified" Teachers

A measure of teacher qualifications is "Highly Qualified" teachers as defined by the State of Colorado in response to the requirements of NCLB. The relationship between this measure and student learning has not been well researched, but appears to be correlated to school performance (CDE, 2006). The definition of "Highly Qualified" has changed slightly as the US Department of Education is reviewing state regulations. Using data from CDE, Table 11 shows the proportion of "Highly Qualified" teachers by school level student characteristics. These data are slightly different from other measures, with the schools categorized by CDE. In this case, high and low poverty schools are those schools in the top and bottom quartile of FRL enrollment. High poverty schools have 58% or more students eligible for FRL and low poverty schools have 15.9% or fewer students eligible for FRL. Even though the teacher qualification and school classifications were created by CDE, the pattern shown here is clear: As student poverty increases, teacher qualifications decrease. In this case, as schools have more students in poverty, they have fewer "Highly Qualified" teachers. While not shown here, these patterns are repeated for most measures of "Highly Qualified" teachers and for schools classified by proportion of minority students, meeting AYP, and high proportions of English language learners (ELL) (CDE, 2006).

| **Table 11:** Percent of Classes Taught by "Highly Qualified" Teachers by School Poverty, 2005			
	Elementary	Middle School	High School
Low Poverty School	93%	92%	96%
High Poverty School	90%	90%	92%

Source: CDE 2006

Teacher Attrition and Student Race/Poverty

This section provides data on teacher attrition (i.e. teachers leaving their jobs) and its relationship to student poverty and race. Teacher attrition/retention can be interpreted as a measure of whether a school has an environment that can support school improvement and teachers' growth in skills and knowledge. Higher attrition is believed to disrupt those efforts (Ingersoll, 2001). While not shown here, analysis of Colorado teacher attrition shows a similar correlation with math achievement as was shown with novices and bachelor's degree only teachers.

Figure 14 is similar to the earlier charts in that schools are categorized by student characteristics; however, the teacher characteristic is attrition. The patterns are similar to those shown with teacher qualification: higher attrition rates as the proportion of minority students increases; and while overall attrition has decreased, there has been an increase in the attrition differences between high and low minority schools between 2000 and 2004. Teacher attrition in schools categorized by FRL students results in similar patterns.

Figure 14: Teacher Attrition by Proportion of Minority Students, 2000 & 2004
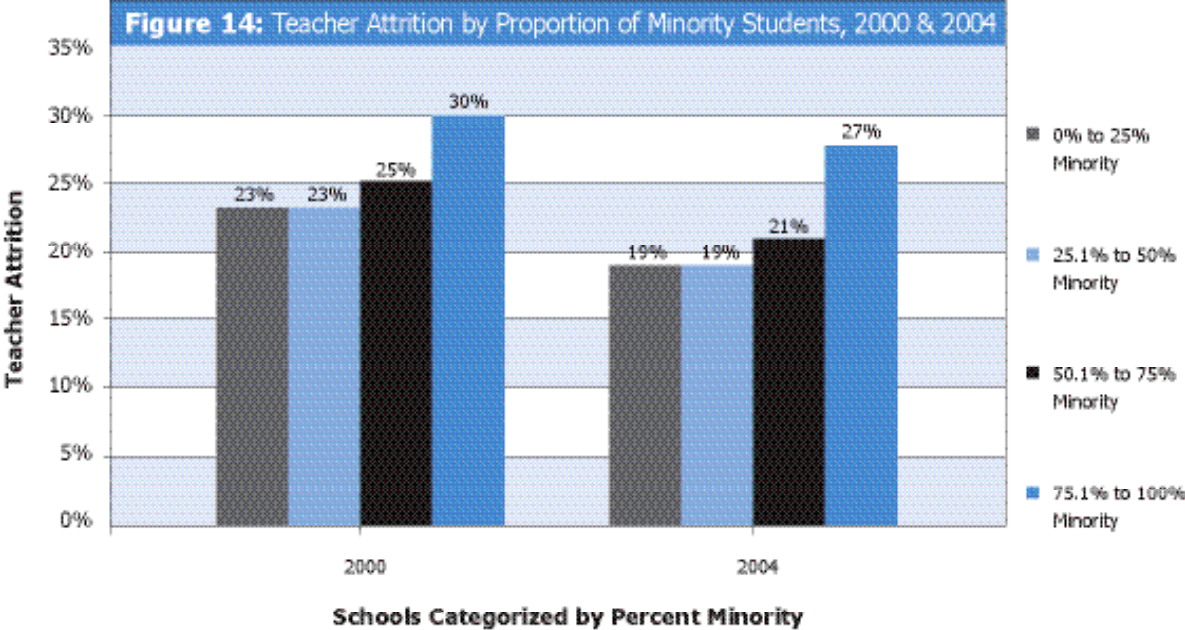
Source: SAR, 2001, 2005 & publicly available enrollment data

DISTRICT LEVEL MEASURES OF THE TEACHER GAP

The data discussed thus far show the differences between schools in the number of less qualified (i.e. novices, bachelor's degree only, and "Highly Qualified") teachers as well as teacher attrition. The data has shown that schools with high proportions of minority and FRL students have a higher number of less qualified teachers than schools with few minority or FRL students. More importantly, the differences in equity between high and low poverty/minority schools have increased between 2000 and 2004. This analysis was focused at the school level. That same data can be used to compute the proportion of minority and FRL students served by novices and bachelor's degree only teachers at the district level.

The analysis rests on the assumption that students are evenly distributed to all teachers within a school. There is some evidence that within schools, FRL and minority students are concentrated in the classrooms of less qualified teachers (Clotfelter et al, 2004). That means that these estimates are probably conservative since they are built upon school level data and only have meaning in districts with many schools. For that reason, the following district level data are presented only for the largest 20 districts, i.e. those with over 10,000 students.

The advantage of this analysis is that it can be used to provide one measure of the teacher gap for a district, regardless of whether that district has few minority students or many minority students. This measure is the difference in proportion of minorities or FRL students served by a less qualified teacher compared to the proportion of white or non-FRL students served by a less qualified teacher.

Figure 15 shows the teacher gap in terms of the difference between the proportion of minority and white students served by less qualified teachers (i.e., novice and bachelor's degree only teachers) and the same difference between students who are not eligible for free and reduced lunch and those who are (FRL), for the 20 largest districts in the state. A value of zero would mean that the percentage of minorities and whites and FRL and non-FRL students served by less qualified teachers is the same. A negative number means that a greater percentage of minorities or FRL students are served by less qualified teachers than whites or non-FRL students. As Figure 15 shows, each measure is negative. This means that, on average within these 20 districts, minority and FRL students are more likely to be served by less qualified teachers.

Minority and FRL students are more likely to be served by less qualified teachers.

Figure 15: Measures of the Teacher Gap in the 20 Largest Districts, 2005
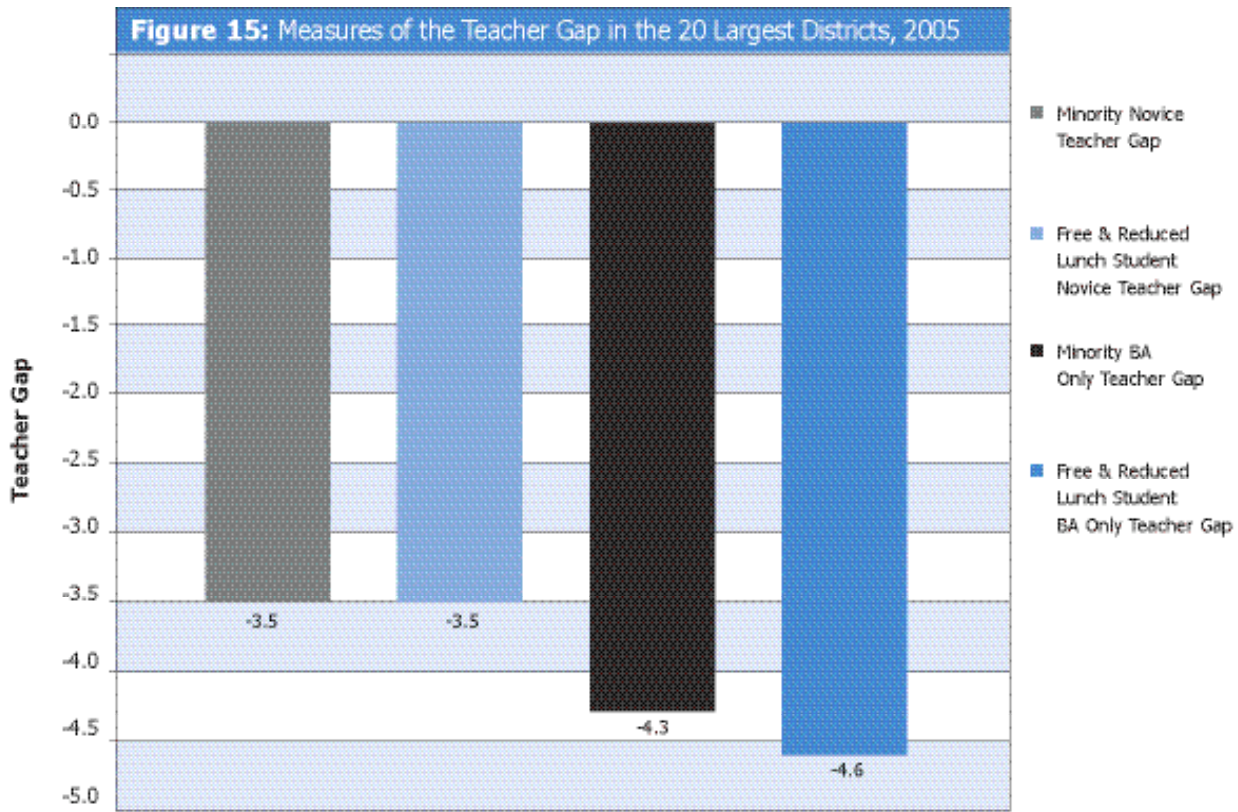
Source: CDE HR data

There are differences between districts. Table 12 shows the districts with the largest and smallest teacher gaps (out of the 20 largest districts in the state). The districts with the largest teacher gaps are Denver and Pueblo City 60. Aurora and Academy 20 show a positive teacher gap, i.e. their minority and FRL students are more likely to be served by an experienced or highly educated teacher than white or non-FRL students.

Table 12: Districts with the Largest & Smallest Teacher Gap, 2005t

|	Minority Novice Teacher Gap	Free & Reduced Lunch Student Novice Teacher Gap	Minority BA Only Lunch Teacher Gap	Free & Reduced Student BA Only Teacher Gap
Districts with the Largest Teacher Gap				
Denver	-5.9	-5.6	-3.0	-2.7
Pueblo	-2.4	-3.4	-1.4	-1.2
Districts with the Largest Positive Teacher Gap				
Aurora	1.5	1.9	0.0	0.3
Harrison	2.8	3.5	4.4	5.1

Source: CDE HR Data

CONNECTING THE TEACHER GAP WITH THE ACHIEVEMENT GAP

Standards-based reform with its goal of higher achievement for all students has underlined the need for quality teachers for all students in Colorado. The positive news is that Colorado test score averages are generally above the national average (NCES, 2006c). However, Colorado also has fewer minority and poor students than the average state (NCES, 2006a). What is more problematic is that Colorado has a relatively large and persistent "achievement gap" between white and minority as well as between low-income and non-poor students (Teske, Brodsky & Medler, 2006). The achievement gap is the difference in performance between minority and white students or between FRL and non-FRL students on the Colorado Student Assessment Program (CSAP).

Figure 16 shows the math achievement gap between minority and white students in 2005 in the state's 20 largest districts. The achievement measure is the percentage of students that are proficient and advanced on the math section of the CSAP for all grades tested. Districts with the largest gap are on the left and smallest gap to the right. The percentage next to each district name is the percent of minority students in that district.

A key point is that the achievement gap is not a function of simply having high achieving white students. There are some districts with high achieving white students (i.e. over 70% proficient or advanced) that have large achievement gaps and some with high achieving white students that have small achievement gaps. Also, the achievement gap is not directly correlated with the proportion of minority students in each district. What is not included in the analysis is the percent of minority students in each district who are also second language learners. This too, would have a significant effect on the achievement gap and requires further research. Another factor not considered in this analysis is the achievement level, i.e. average math CSAP score.

Figure 16: Math Achievement Gap in Colorado's 20 Largest Districts
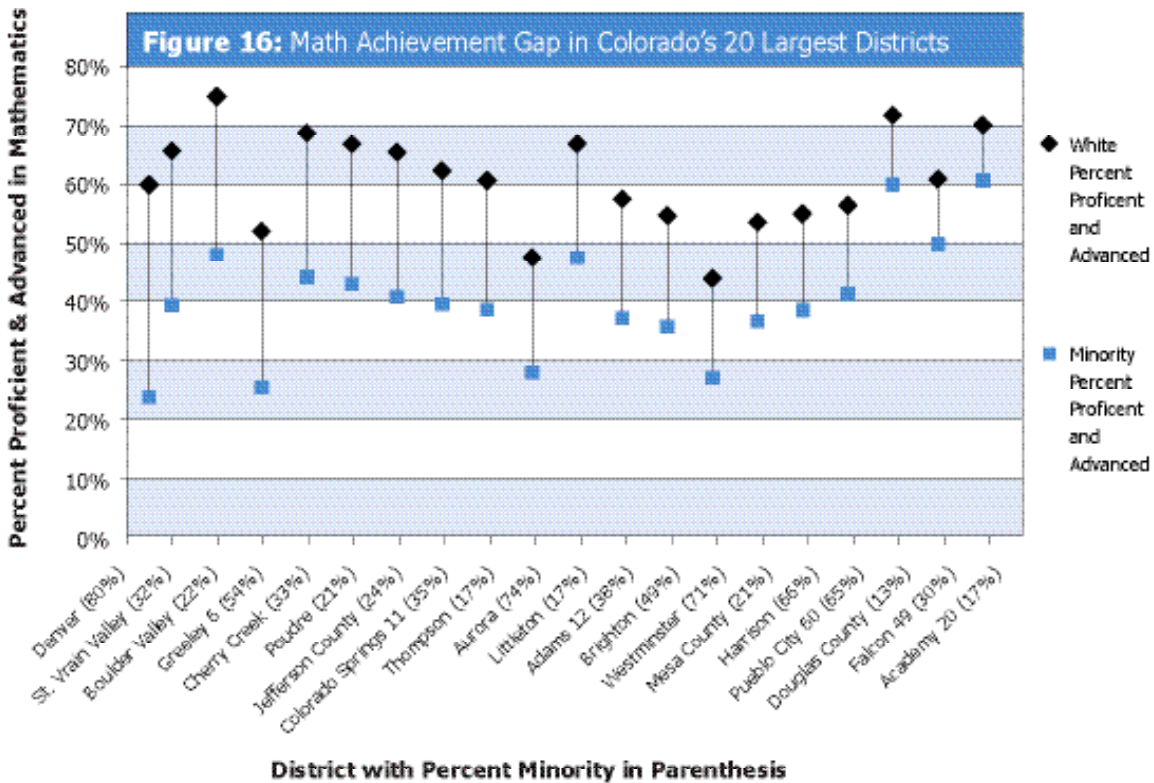
Source: Publicly available CSAP results

The achievement gap in Colorado's 20 largest districts is correlated with some of the teacher gap measures. Figure 17 is a scatter plot that shows the relationship between the minority-novice teacher gap and the minority-math achievement gap. The line shows that on average, the math achievement gap decreases by 1.5 percentage points for every percentage point decrease in the minority novice teacher gap.[20]

Figure 17: Scatter Plot between the Minority Novice Teacher Gap and Math Achievement Gap, 2005
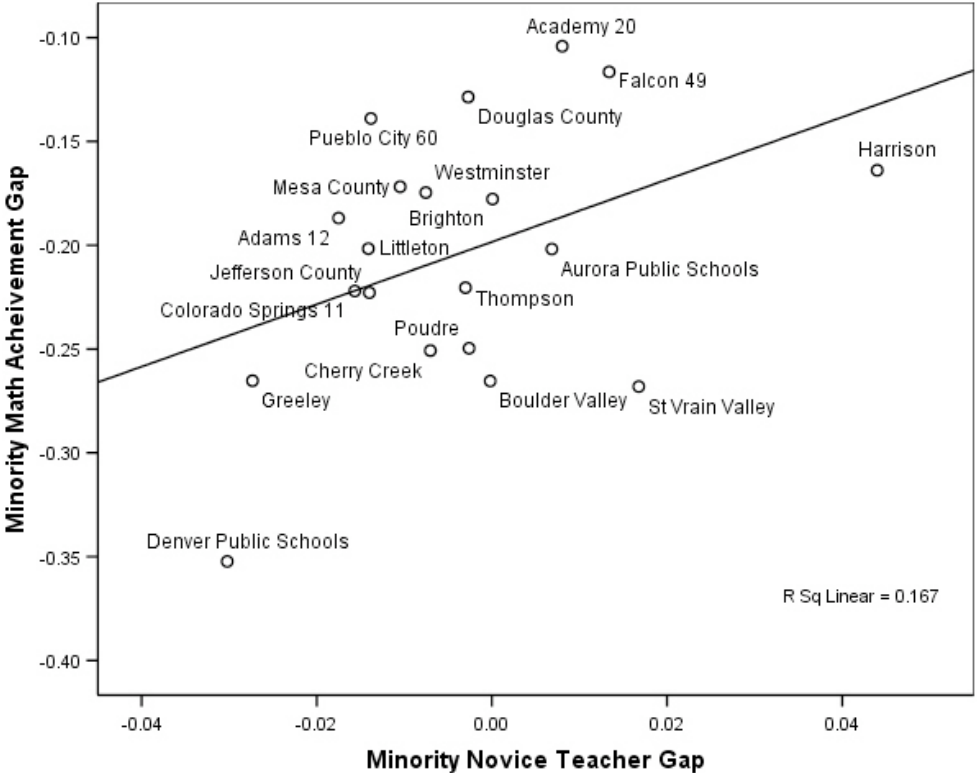
Source: CDE HR and publicly reported CSAP data

Not all districts have a negative teacher gap; nine districts have a "positive" teacher gap. A positive teacher gap is when minorities are less likely than their white counterparts to have less qualified teachers. However, even those districts with a positive teacher gap have an achievement gap, albeit smaller on average.

This statistical relationship does not hold, however, for the FRL achievement and performance gap, which may be due to the fact that FRL eligibility is not accurately reported at the secondary level. This would lead to inaccurate measures of both the FRL achievement and teacher gaps, as well as errors in the estimates in the statistical relationship between the teacher gap and FRL achievement gap.

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[20] These results come from a linear regression of the achievement gap on the minority novice teacher gap. The r-squared on the regression was .167, the coefficient on teacher gap was 1.503 with a standard error of .79 and was significant at the .0703 level. This significance level is slightly more liberal than the traditional .05 level.

ASSESSING EQUITY IN TEACHER SALARY EXPENDITURES

Teachers' salaries can be seen as a measure of resource allocation within districts. Teacher salaries are the largest single use of resources within districts and schools. Some research has shown that within some districts, high poverty and high minority schools were allocated fewer resources including teachers (Miller, et al., 2004). Figure 18 shows the estimated teacher salary expenditure per student in schools categorized by grade level and minority enrollment.[21]

Figure 18 shows different patterns for different grade levels. Average teacher salary expenditures are approximately equal (ranging from $2,683 to $2,621) in elementary schools with minority enrollments from 0% to 75%. However, expenditures are lower ($2,539) in the elementary schools with over 75% minority students. The pattern in middle schools is different. Expenditures in the middle schools are relatively equal, ranging from $2,459 to $2,344, with the highest amount spent in schools with 50% to 75% minorities. In high schools, average expenditures decline as minority enrollment increases over 75%. Expenditures in the high minority high schools are 18% less than those in the low minority high schools. Mixed grade schools make up a small number of schools (about 200 out of the approximately1700 total schools). Here, expenditures decline as minority enrollment increases by about 7%. These differences may be a product of the many different school configurations in this group, however. Ultimately additional research is needed to understand the factors that are driving these differences.

[21] Grade levels are taken from the enrollment data; schools that serve multiple levels (i.e. all grades, elementary and middle grades, and middle and high school grades) are categorized as mixed grade level. Salaries are broken out by grade levels since staffing patterns and salary levels may differ at the different grade levels. As noted earlier, salaries are related to both teacher experience and teacher education level. Calculating salary expenditure per student includes the average salary of teachers in a school and the number of teachers in that school; not accounted for are expenditures on support specialists such as school psychologists, speech/language pathologists, or librarians.

Figure 18: Average Salary Expenditures Per Student By Minority Enrollment, 2005 (All Schools)
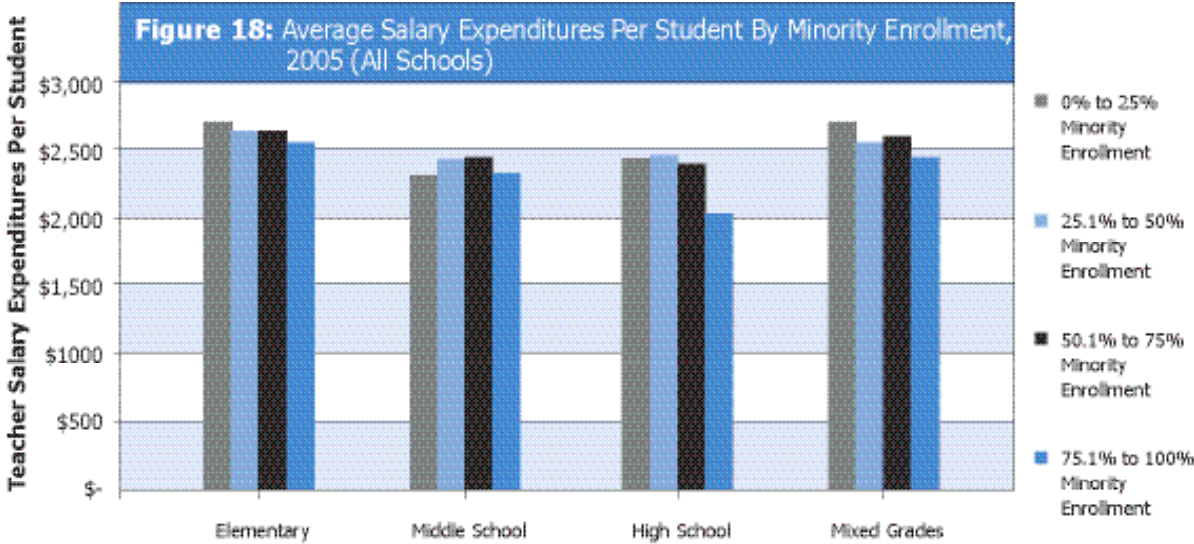
Source: CDE HR and enrollment data

The patterns seen above do not hold when looking at schools categorized by free and reduced lunch (FRL) enrollment (Figure 19). Salary expenditures are essentially the same when looking at elementary and middle schools categorized by FRL enrollment. In high schools, expenditures increase (9%) as the proportion of FRL students increases. The differences are the most dramatic in mixed grade schools. Here the difference in expenditures between schools with the fewest and most FRL students is 29%, or $637 per student.

Figure 19: Average Salary Expenditures Per Student By Free & Reduced Lunch Eligible Enrollment, 2005(All Schools)
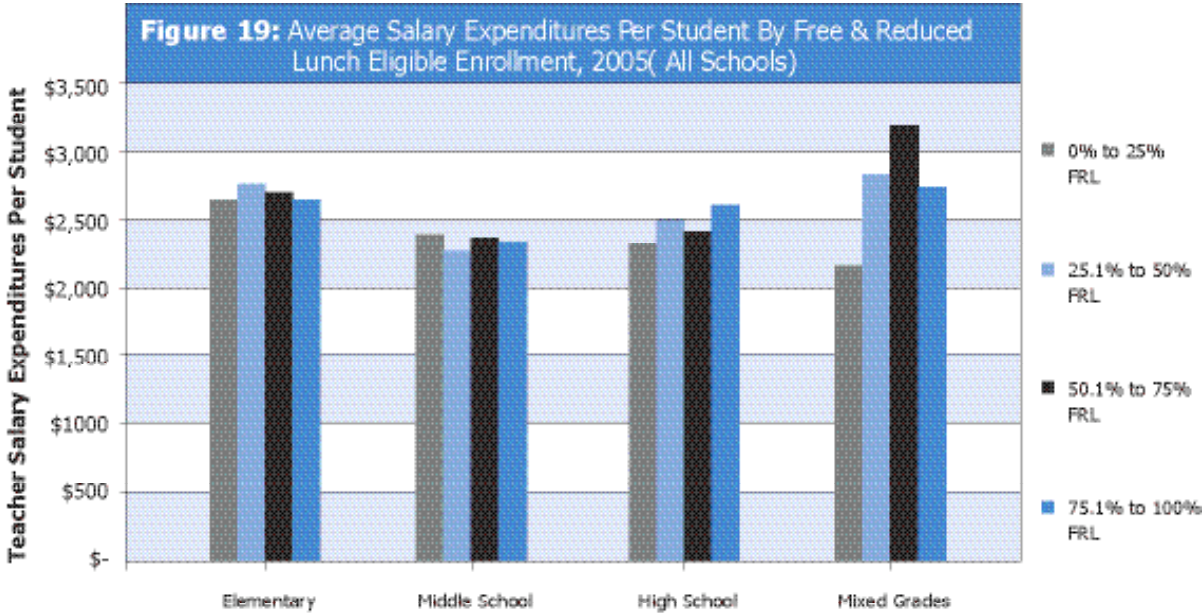
Source: CDE HR and enrollment data

These data suggest that equity issues for expenditures are a statewide concern. However, examination of district level data shows that salary expenditures in Denver Public Schools (DPS) may be driving many of the statewide differences. This is because DPS average teacher salary expenditures are much lower than other districts in the state ($2,245 compared to $2,583) and that DPS has many (102 of 225) of the high minority (75% to 100%) schools. Figure 20 shows the salary expenditures per student in 19 of the 20 largest districts, with DPS removed from the analysis. Without DPS, the salary expenditure gap disappears for elementary schools. In middle schools, expenditures are 17% higher in the high minority schools. However, expenditures are lower in the high minority high schools and mixed grade schools (by 19% and 12% respectively).

Figure 20: Average Salary Expenditures Per Student By Minority Enrollment Without DPS, 2005
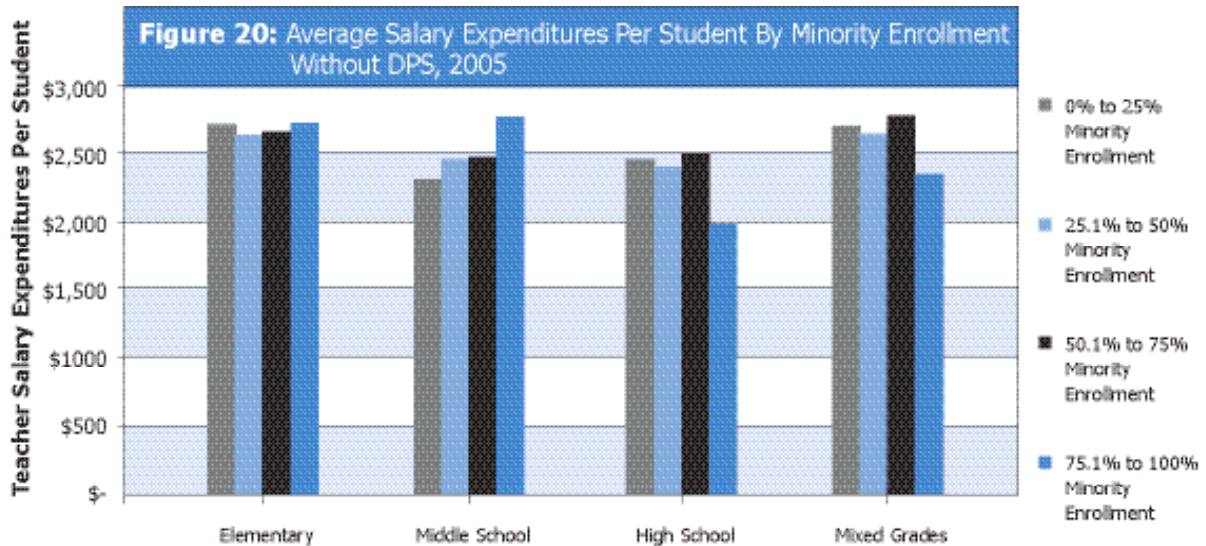
Taken together, the salary expenditure data present some important conclusions. First, average teacher salary expenditures per student in Denver Public Schools are $238 lower than in the other districts. Second, when looking at minority enrollments, there appear to be important differences in teacher salary expenditures in high schools and mixed grade schools. However, these patterns do not hold when schools are disaggregated by free and reduced lunch enrollment. Finally, these patterns hold with and without Denver Public Schools.

SUMMARY OF FINDINGS

This chapter provided extensive detailed information about teacher qualifications in Colorado and the equitable allocation of well qualified teachers.

Teacher Qualifications

- Districts with higher concentrations of bachelor's degree only teachers (74% to 93%) were often located on the eastern plains.
- Districts with high proportions of novice teachers are largely concentrated in districts adjacent to the cities along the Front Range.
- Student achievement is correlated with teacher qualifications: Average ACT scores go down as the proportion of novice and bachelor's degree only teachers increase and the highest scoring schools on CSAP have the fewest novice and bachelor's degree only teachers.
- The proportion of novice and bachelor's degree only teachers decreased between 2000 and 2005.

The Teacher Gap

- There is a teacher gap at the school level; teacher qualifications decrease as the proportion of FRL and minority students increase using multiple measures.
- Not only is there a gap, but the gap is widening: there has been an increase in the disparity in teacher qualifications between high and low poverty schools since 2000.
- The minority achievement gap decreases by 1.5 percentage points for every percentage point decrease in the minority teacher gap.
- Even those districts with a positive teacher gap have an achievement gap, albeit smaller on average.

Other Teacher Measures

- Attrition rates increase as the proportion of FRL and minority students increases.
- The difference in attrition rates increased between high and low FRL schools since 2000.
- There were decreases in attrition between 2000 and 2004.
- High attrition districts and low attrition districts are scattered throughout the state and in both urban and rural areas.
- Teacher salary expenditures are lower in high minority schools at some grade levels but not all.
- Average teacher salary expenditures in Denver Public Schools (DPS) were lower than the other large districts in Colorado.

Overall, the allocation of teacher quality in Colorado can be summarized in this way: The greater the proportion of minority students or students eligible for free and reduced lunch within a school or district, the lower the experience, education level and salary of the teachers and the greater the attrition rate. This discrepancy by race and poverty has grown larger since 2000 for all indicators. In addition, increases in the white-minority teacher gap are correlated with increases in the white-minority achievement gap.[22]

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[22] There are some exceptions to this general statement in regard to salary.

QUESTIONS RAISED FROM THE FINDINGS

The most pressing policy issue resulting from the findings is **how to reduce the teacher gap** throughout Colorado. However, the extent of the teacher gap varies by district, including some districts that have a positive teacher gap associated with smaller achievement gaps. Thus, the state level policy response must address the following questions in order to close the negative teacher gap while encouraging and expanding the positive teacher gap:

- What local and state policies and practices have helped close the teacher gap?
- What local and state polices and practices exacerbate the teacher gap?
- How are/can state and local policies and practices be evaluated to assess progress?
- Which specific policy tools would help local and state policymakers close the teacher gap throughout Colorado?
- What accountability measures need to be in effect at state, district and school levels?

There are additional important policy questions that must be investigated to support progress toward ensuring that there is a quality teacher in every classroom. These questions include:

- While it appears that smaller districts may be serving as feeder districts to districts within Denver, there is currently no way to track and confirm the movement of teachers within and among schools and districts. Where is movement of teachers occurring? Which areas face larger or smaller losses of teachers? This information should then be used to answer further questions. Which policies and practices support quality teaching? How can we extend those policies and practices to all districts?
- It appears that Denver Public Schools spends less on teacher salaries than its neighbors. What are the factors leading to this difference in resource allocation? How do those differences support or detract from teacher quality and student learning?

6. SUMMARY OF FINDINGS AND RECOMMENDATIONS

FINDINGS

• Teachers in Colorado work in many different environments.

The data clearly paint a picture of the diverse environment and working conditions within which Colorado teachers teach.

Colorado teachers work in 178 districts that range in size from tens to tens of thousands of students.
- Seventy-five percent of Colorado's K-12 students attend schools in only 20 districts, the large majority of which are in the Front Range.
- Some districts are growing while others are shrinking. Most of the districts experiencing growth in enrollment are on the Front Range or I-70 corridor.
- Colorado teachers work in schools that are diverse in enrollment of minority students and students in poverty.
- Schools range from those that have no minority students to 100% minority.
- Minority students and students eligible for free and reduced lunch are concentrated in urban areas on the Front Range and the southern part of the state.

These factors have immense impact on how policy decisions are made in the various environments.

• The Colorado teacher workforce:

- Consists of just over half of all teachers prepared in Colorado, with many new teachers (27%) prepared in other states.
- Is growing the fastest in the areas of special education and English/language arts.
- Has a slightly increased proportion of male teachers, from 26% to 26.1%.
- Has a slightly increased proportion of minority teachers, from 9.4% to 9.6%.
- Remains predominately white (90.4%) and female (73.9%) even though the student population is increasingly more diverse.

These factors have implications when looking at Colorado teacher preparation programs, hiring decisions, salaries and professional development.

• There are unanswered questions about the demand for teachers and the supply to meet the demand.

The data available for this report simply do not allow firm calculations of current or future teacher demand, and this report has not investigated the impact of salaries on teacher supply. At the same time, there is not one definitive source of data on the three teacher pipelines in Colorado.

Our research, however, resulted in the following findings:
- Although there is a nationwide concern with teacher retirements, teacher retirements in Colorado appear to have passed their peak.
- There is a general alignment between Colorado higher education based (traditional) preparation programs and subject area demand, although the data are not complete. The one exception may be mathematics, which has relatively low enrollment in Colorado traditional preparation programs.
- Average teachers' salaries in Colorado in 2003 were slightly lower than the nation's average.
- Colorado teacher salaries were higher than all of its neighboring states but lower than those states that are the largest source of Colorado's teachers prepared in other states.

• The data about teachers in Colorado are incomplete, inhibiting the ability to improve teacher quality and student achievement.

There are significant weaknesses in the data that were available for this report. Data are either incomplete or unavailable and inhibited the conclusions that could be drawn particularly as teacher quality relates to student achievement.

The data do not have a unique teacher identifier that allows linking of teacher records across years. Lacking a consistent teacher identifier, this report is unable to include information on:
- teacher attrition by experience and subject taught
- teacher movement between schools and districts
- returning teachers, i.e. teachers who take a year or more off and then return to teaching
- movement of teachers in and out of other industries (can only be done with a SSN)

Information to link teachers with their students is unavailable. This reduced the quality and quantity of information in this report in two ways:
1. The analysis assumes that students are randomly assigned to teachers regardless of student and teacher characteristics within a school. This unlikely and conservative assumption — required by data limitations — means that the teacher gap is probably underestimated.
2. The lack of a link between students and their teachers does not allow analysis of each teacher's contribution to student learning, i.e. value added. This means we are unable to directly analyze some of the most important questions to Colorado policymakers, practitioners and parents. These questions include:
    - Which teachers are most effective in promoting student achievement?
    - Where do these teachers work in Colorado and why?
    - What policies and programs best support the development of quality teachers who are most effective in promoting student achievement?
    - Are quality teachers distributed equitably among diverse classrooms?

- **There is a teacher gap in Colorado that is widening and correlated with student achievement.**

  - The number of less qualified teachers (defined for purposes of this study as two or fewer years of teaching experience or minimal education required for license, i.e. a bachelor's degree only) overall in Colorado has declined between 2000 and 2004.
  - More qualified teachers are not equitably distributed throughout the state. Schools serving high proportions of minority and free and reduced lunch eligible students across the state are more likely to have less qualified teachers. The higher proportion of less qualified teachers assigned to poor and minority students is called the teacher gap.
  - The proportion of minorities and free and reduced lunch (FRL) students that are taught by less qualified teachers is higher than the proportion of white students or those students who do not qualify for FRL in the largest twenty districts.
  - This inequality, the teacher gap, has grown since 2000 on most measures.
  - The teacher gap is highly correlated with the achievement gap at the district level for minority students. This correlation does not hold true, however, for FRL students.
  - There are large differences between districts in the extent of their teacher gap. Some districts do not have a teacher gap, and some even have what is termed a 'positive' teacher gap, where poor and minority students are more likely to be assigned more qualified teachers. Unfortunately, even districts with a positive teacher gap are facing achievement gaps between minority and white students, albeit smaller gaps, on average.
  - When looking at school level teacher salary expenditures in the largest 20 districts, the schools with over 75% minority or FRL students spend less on average than most schools.

RECOMMENDATIONS

While overall educational outcomes in Colorado have remained relatively high, the persistent achievement gap, as well as the Colorado Paradox of low college graduation rates, point to a need for even greater reform efforts.

The findings in this report clearly describe the diversity of environments in which teachers teach. Thus, although the Alliance for Quality Teaching seeks a quality teacher in EVERY Colorado classroom, single policy solutions are not likely to fit the diverse needs of each school and district.

The recommendations below are intended to guide Colorado toward local and statewide decisions that will drive policies toward increased teacher quality and a reduced teacher gap.

1. The Legislature and governor should appoint a Colorado Teacher Gap Commission.
The Commission should be made up of representatives of the community, teachers, parents, professional associations, advocates, researchers, higher education, school district administrators, and local/state policymakers with the explicit charge to systematically seek answers and provide solutions to the following questions raised in this report:
a. What local and state policies and practices have helped close the teacher gap?
b. What local and state polices and practices exacerbate the teacher gap?
c. How are/can state and local policies and practices be evaluated to assess progress?
d. Which specific policy tools would help local and state policymakers close the teacher gap through-out Colorado?
e. What accountability measures need to be in effect at state, district and school levels?

2. Colorado state agencies and school districts should work together to improve data collection, access and use.
Data is a major tool to assist policymakers as they make decisions to improve student learning. Toward that end, state level data should become a more useful resource for local policymakers.[23] The data must be clean and readily available to local districts to support their efforts to improve and support teacher quality.

For state level data to become a more useful resource, it is recommended that:
a. The Legislature direct funding to the Colorado Department of Education (CDE) and Colorado Commission on Higher Education (CCHE) to develop a unique teacher identifier that allows linking of students and their teachers, including a clearly defined policy to balance protections and benefits.
b. The Legislature and the State Board of Education direct CDE to develop a clear policy for sharing data with schools, districts, policy researchers and advocates to support accountability and improved student learning.
c. The State Board of Education direct CDE to work with the Alliance for Quality Teaching to convene a technical advisory group of data experts to ensure accurate and valid implementation of establishing a unique teacher identifier.
d. The State Board of Education direct CDE to work with school districts and other educational organizations to increase the capacity to use data for accountability and student achievement.

[23] It is important to note that the Colorado Department of Education (CDE) also recognizes the need for data in support of teacher quality: "Colorado will begin to collect and analyze research and data associated with teacher quality and effectiveness." (CDE Highly Qualified Teachers State Plan, submitted to the US Department of Education, 2006).

3. The Alliance for Quality Teaching and other organizations should conduct additional research to support policy and practice around teacher quality in Colorado.

This report clearly provides evidence that a greater body of knowledge must be investigated. Many questions about teacher quality in Colorado remain unanswered. Some of the questions that should be addressed are:

- What is the relationship between the diversity of the teacher workforce, the diversity of the student population and reducing the achievement gap?
- What are the most pressing issues in terms of teacher supply and demand?
- What practices in teacher preparation programs prepare quality teachers who help close the achievement gap?
- What programs and practices at the district level are effective in attracting, hiring and retaining high quality teachers?
- What programs, practices, and teacher characteristics shape teachers' ability to reach the broad democratic goals for public education?

The Alliance specifically recommends research to:

a. Investigate value-added methodology and its ability to increase the flexibility of data analysis and enhance the quality of questions that can be pursued with the data. Adoption of the value-added method is both a statistical exercise and a communication task. No value-added system will be perfect and its limitations must be clearly known by all who use it. At the same time the data must also be transparent so districts and researchers can modify and adjust the system to meet their needs and, in the long run, improve the methodology used here and across the nation.[24]

b. Investigate teacher supply and demand issues. To ensure quality teachers in every classroom, we must meet the needs for teachers in subject areas where there is greater demand.

4. The Alliance for Quality Teaching should engage policymakers in discussion about the key policy questions identified within this report.

The information in this report will be valuable only if it is further analyzed by state and local policymakers to correlate the findings with what local policymakers know of their districts' individual needs.

5. The Alliance for Quality Teaching and other organizations should work with policymakers at all levels to identify, advance and implement the policy changes necessary to eliminate the teacher gap, achievement gap and data challenges.

[24] Colorado began movement toward a longitudinal growth model in 2004 with H.B.04-1433, and continued moving toward building a value-added methodology in 2006 with H.B.06-1109.

CONCLUSION

With all children learn as the goal for the Colorado education system, and research that confirms teacher quality as the central tool in reaching that goal, we are compelled to focus attention on the teacher and quality teaching issues. The findings and recommendations of this report are merely the beginning. Policymakers must delve further into the data and the issues presented here. They must discuss the key questions with other decision-makers and take action on priority issues to improve the quality of teaching in Colorado.

The system of education in Colorado is complex and includes varied stakeholders. If we are to achieve our goal, we need strong leadership and a coordinated strategy. We must work together toward our goals to become a powerful force for our children and their future. The status quo cannot continue — our children and their future are much too important.

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APPENDIX A: ADDITIONAL DATA ON SCHOOL AND DISTRICT DIVERSITY

This appendix provides additional information on the diversity of the schools and districts where Colorado's teachers work.

School Poverty

Figure A1 shows the proportion of students eligible for free and reduced lunch (FRL) by district. The cut points are determined by quartile. The districts that serve the highest proportions of FRL eligible students are in the southern part of the state, Denver, Pueblo and to a lesser extent along I-76. The two high poverty districts east of Colorado Springs are Ellicott (58% FRL) and Miami-Yoder (55% FRL). There are many districts in the second highest quartile of FRL eligible students (38-53%) on the eastern plains, central mountains, and the southwestern part of the state.

Figure A1: Map of Percentage of Students Eligible for Free and Reduced Lunch, 2005
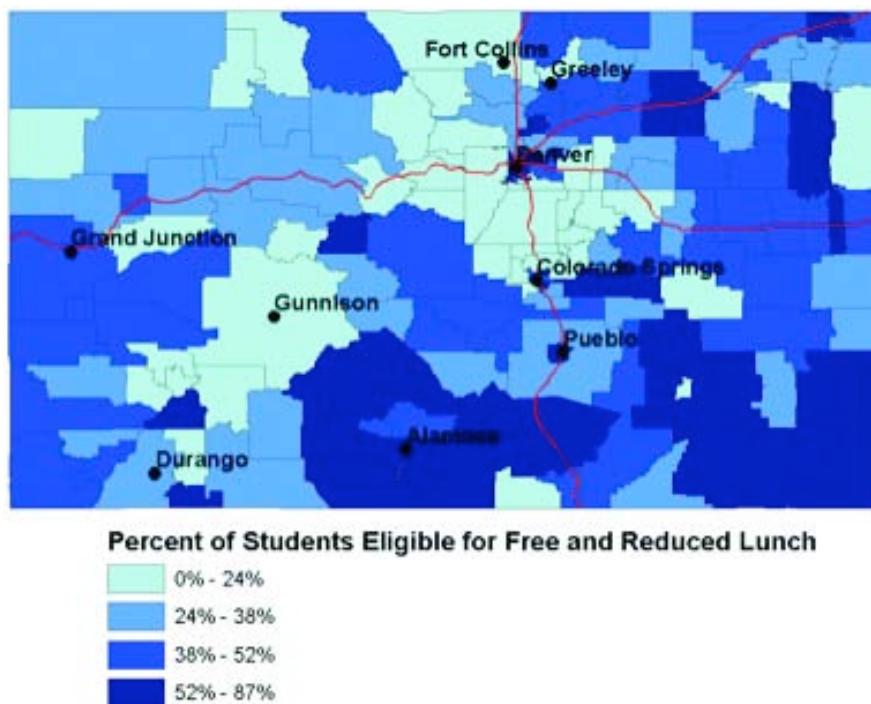
Source: CDE Public Data

Figure A2 shows the 2004 proportion of students proficient and advanced in mathematics according to the School Accountability Report. As discussed earlier, math is shown since it is the subject most sensitive to teacher quality. Again the cut points are set using quartiles.The scores are correlated at the school level with the percent of free and reduced lunch (FRL) (-.45 correlation coefficient). The high scoring districts (dark blue) are scattered throughout the state. The low scoring districts are somewhat concentrated in the eastern and southern part of the state.

Figure A2: Map of Average District Math ACT Score, 2004
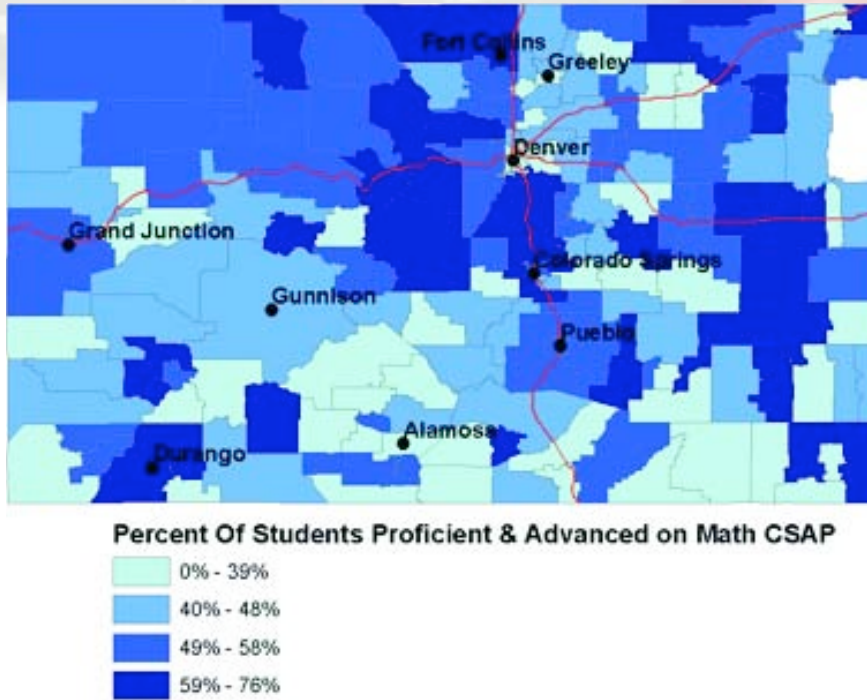
Source: CDE Public Data

APPENDIX B: ROUTES TO TEACHING

In Colorado, the three primary routes to enter the teaching profession are: Colorado traditional programs, Colorado alternative programs, and out-of-state programs.

Colorado Higher Education (Traditional) Route to Teaching

Traditional routes to teaching involve training at a Colorado college or university. During the 2004-2005 school year, close to 9,170 students were enrolled in traditional teacher education programs in Colorado, a 15% increase over the previous year (CCHE, 2006).

The traditional teacher education programs in Colorado are under the control of institutions of higher education, but must be reauthorized every 5 years by both the Colorado Department of Education (CDE) and the Colorado Commission on Higher Education (CCHE), pursuant to regulations contained in C.R.S. 23-1-121. As of the 2005 school year, all authorized teacher preparation programs were determined to be compliant with Colorado's performance based teacher education measures (CCHE, 2006).

The traditional teacher preparation programs have been the subject of legislative or regulatory reform four times over the past seven years:

- Senate Bill 99-154 (signed into law June 1, 1999). SB 99-154 was passed to add additional accountability into in-state teacher preparation programs by requiring that programs meet

performance-based standards in order to continue training new teachers. Some of these minimum standards included: course work and field-based training tied to the Colorado Model Content Standards; 800 hours of field-based experience, and on-going content knowledge assessments. This law also called for teacher candidates to meet a series of performance-based demonstrable skill standards in order to successfully earn a teacher license. These standards were teacher focused and emphasized pedagogical and technical abilities.
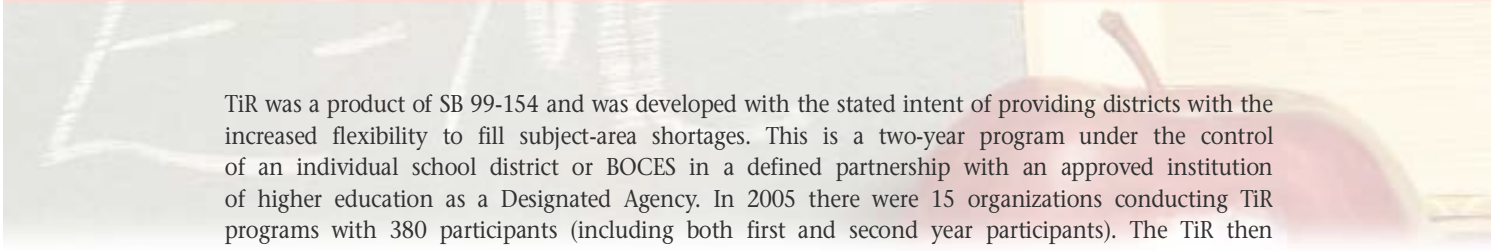
- The Colorado State Board of Education adopted a second set of reforms in September 2003. The impetus for this second round of reforms was the federal No Child Left Behind Act (NCLB) of 2001. Specifically, the "Highly-Qualified Teacher" mandate requires states to develop a means to evaluate and prepare the teacher workforce to meet subject-area, pedagogical, and certification standards. Colorado developed a new set of endorsement preparation standards through a two-year collaboration of K-12 practitioners and higher education faculty in order to meet the federal requirements. Building on the skill focused licensure requirements of SB 99-154, the new standards were based on PK-12 student content standards. These changes brought the teacher preparation rules and student content standards into alignment. This alignment was noted by the National Council on Teacher Quality, with Colorado earning the only "A+" rating in an analysis of states' "Highly Qualified" teacher actions (NCTQ, 2004).

- A third round of reform occurred with the implementation of the new performance contracts in 2004 from the Colorado Commission on Higher Education (CCHE). All draft contracts contained requirements for what teacher candidates should be taught and requirements for the qualifications of professors and instructors.

- Currently (fall 2006) the Reading Directorate at the Colorado Department of Education is reviewing teacher education programs for the literacy content of their class work (CDE, 2006).

The end result is a traditional teacher preparation system that is regularly facing changes and reforms driven by state level policy-makers.

Colorado Alternative Routes to Teaching

The second path to teaching in Colorado is through two alternative routes that allow people with subject matter expertise to learn how to teach while working as teachers. There are two alternative routes: One-Year Alternative Licensing Program (ALP) and Two-Year Teacher in Residence (TiR) program.

Alternative programs offer individual districts more flexibility in hiring qualified candidates and control in their training, which occurs primarily on-the-job. ALP was originally conceived in HB 90-1150 as a mechanism to increase the amount of non-traditional teachers, attract high-quality graduates to teaching, and offer a simpler means for second career individuals to enter into the profession (Bassett, et al., 2004). In 2005-06 there were 20 organizations with ALP programs including school districts, charter schools, Boards of Cooperative Educational Services (BOCES), universities, and private schools with 447 participants. Presently, an ALP candidate receives a one-year Statement of Eligibility (SoE) from CDE to pursue a teaching position. The alternative teacher is then hired and begins teaching while concurrently receiving 225 clock hours of professional training and evaluation under the direction of the building principal, mentor teacher, and a representative from higher education. The candidate receives a provisional license upon satisfactory completion of the program.

TiR was a product of SB 99-154 and was developed with the stated intent of providing districts with the increased flexibility to fill subject-area shortages. This is a two-year program under the control of an individual school district or BOCES in a defined partnership with an approved institution of higher education as a Designated Agency. In 2005 there were 15 organizations conducting TiR programs with 380 participants (including both first and second year participants). The TiR then completes 200 clock hours of observed teaching, classes, mentoring, and evaluation over the course of the program. Successful completion of this program results in a provisional license plus one-year of the standard new teacher three-year probation period.

Alternative licensure programs have also faced several regulatory changes in recent years in order to move the programs toward similar standards as traditional preparation; some in response to earlier work by the Alliance in this area (see Basset et al., 2003). The September 2003 regulations require that all candidates for licensing - traditional and alternative - must successfully pass either the PRAXIS or PLACE teacher exams in their content area and meet Colorado standards prior to receiving a license and entering the classroom in any instructional capacity. Additionally, while the TiR's defined partnerships have always required a five-year review and on-site evaluation similar to traditional program requirements, the 2003 regulations also call for a five-year review of the ALPs. The intent of these reviews is to provide evidence that all alternative programs meet the same Colorado performance-based standards as required of all traditional preparation.

Out-of-state

The third supply of new teachers in Colorado comes from out-of-state sources. This report shows that preparation programs in other states serve as a significant source of teachers, supplying approximately half of all new teachers in Colorado.

Rules for teachers prepared in other states follow the spirit of the regulations governing in-state preparation programs. An out-of-state applicant for a Colorado teacher license must meet several requirements, including: successful completion of an approved out-of-state preparation program, holds or is eligible for a license issued from another state agency, and has completed Colorado assessments or can provide evidence of three-plus years teaching experience in another state. While the out-of-state rules maintain the spirit of the in-state regulations, it is difficult to determine if out-of-state teachers are prepared at the same level as Colorado-trained teachers due to wide disparities in other state preparation programs and regulations.
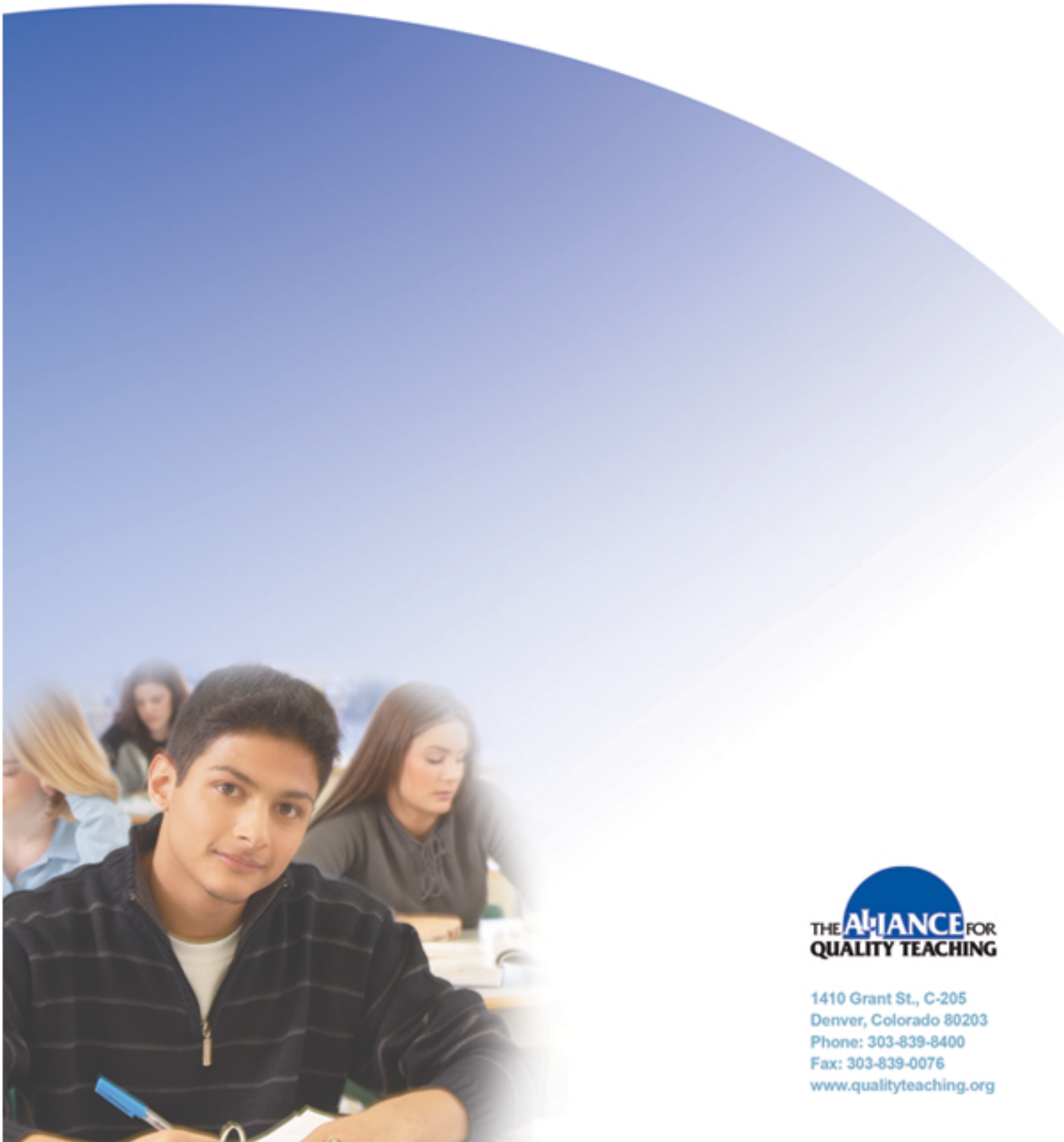
Other Temporary Routes

Finally, it must be noted that a few individuals enter Colorado classrooms using authorizations to teach while they are completing the licensure requirements or if they have extraordinary credentials. These authorizations for people completing their preparation include emergency authorizations and temporary authorizations (usually used for special education). Those with extraordinary credentials include JROTC instructors and teachers with specialized knowledge (such as professors) in a particular subject.

"Research and common sense tell us that one of the surest ways to close the achievement gap in Colorado is to close the teacher quality gap."

Cal Frazier