RECOMMENDATIONS TO STRENGTHEN NORTH CAROLINA'S SCHOOL FUNDING SYSTEM

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Executive Summary

This report was prepared for the North Carolina General Assembly by Augenblick, Palaich and Associates (APA), a Denver-based consulting firm. APA was selected to do the work described in this report through a competitive bidding process to conduct a study of the state's school finance system. This finance system is based on a number of allotments that are used to allocate state aid to each of the state's 115 school districts. APA conducted all of the work that serves as the basis of this report between March and September 2010.

That work included: 1) Conducting an initial set of interviews with a variety of interested and knowledgeable people, including state policymakers, school district organizations, and public policy groups; 2) Reviewing literature concerning the relationships that exist between education resources and student performance; 3) Reviewing written work that has examined North Carolina's school finance system; 4) Analyzing the equity of the revenues obtained by school districts in 2003-04 and in 2008-09; 5) Analyzing individual allotments based on the revenues they provided to school districts in 2003-04 and in 2008-09; 6) Analyzing the relationships between education resources and student performance in North Carolina in 2003-04 and in 2008-09; 7) Conducting on-site interviews with school district administrators that focused on identifying resources districts believe can impact student performance; and 8) Developing two indices designed to reflect geographic price differences across counties and the attractiveness of counties to teachers.

All of this work focused on the **structure** of the allotment system. By that, we mean that we were asked to examine the approaches used to allocate state aid, including the formulaic procedures, and to determine whether changes in the structures of the allotments would improve the equity and/or efficiency with which state aid is distributed *without being concerned about how much aid is distributed*.

Based on all the work and analyses conducted, APA offers a set of potential modifications to the state allocation system. These suggested modifications are intended to be **fiscally neutral** and are listed *in order of their anticipated ease of implementation*. They should be viewed as being distinct from one another. That is, they could be implemented individually and several of them could be implemented simultaneously but some of them, particularly those toward the end of the list, subsume others that precede them.

In some cases, APA uses parameters to illustrate how a modification might be implemented although such parameters should not be viewed as being precise; if the state is interested in implementing a particular change, further work would need to be done to assure that the cost of implementation would, in fact, remain fiscally neutral.

The potential modifications are listed below:

1. **Combine all allotments that are distributed on the basis of total enrollment** (such as the ones for textbooks, instructional materials, non-instructional support, and technology) – not some subcategory of enrollment based on grade level or need – into a single per student allotment, the revenue from which could be used at the discretion of school districts.

2. **Modify the Special Education Allotment** by setting three different payment rates for students with disabilities that can be organized into three cost categories based on disability severity (such as "mild," "moderate," and "severe") and the expected relative cost of each group.

3. **Modify the Low Wealth County Allotment** by either creating two distinct allotments that would be based on simple formulas (one based on district wealth and another based on district school tax effort) or by creating a single formula that would use a power equalizing procedure that other states have employed to distribute aid.

4. **Modify the At-Risk Student Allotment and the Disadvantaged Student Supplemental Fund Allotment** by combining them and distributing funds based on either: (1) the number of low performing students in each district or (2) a proxy for low performance, such as the number of Title I eligible students (as is done in the At-Risk Allotment) or the number of students eligible for federal lunch support (reduced-price and/or free lunch) but do not use a Census-based count since it does not change annually.

5. **Modify the Small County Allotment** so that it is focused exclusively on size, which is a well-known cost factor that is beyond the control of school districts. We would suggest allocating funds on the basis of district size, not county size, since the size of the district is what creates the cost pressure that state aid should be used to mitigate.

6. **Change the way that Lottery funds are distributed** to support school buildings. Given that the primary responsibility for the construction of school facilities lies with school districts, state aid should be allocated with two objectives in mind: (1) to wealth equalize paying for facilities; and (2) to provide an incentive for school districts to support needed facilities. Current aid is not wealth equalized and our examination suggests that it has not served as an incentive to generate local funds by raising local tax effort.

7. **Modify the Teacher Allotment** to change the way the number of state-paid teachers allotted to each district is calculated. Because the student-based needs of districts vary, we would suggest using a weighted student count, not the ADM count, to recognize those differences (under the assumption that most special student needs, such as participation in special education programs, are addressed through the use of more teaching personnel (to lower class size and/or to extend student engagement). Our belief is that weights for special education, at-risk students, limited-English proficient (LEP) students, gifted students, and students enrolled in vocational programs should be used. Weights could be created for the three levels of special education discussed above.

8. **Modify the Statewide Teacher Salary Schedule** by adding factors that would make it sensitive to uncontrollable cost pressures that districts face in paying teachers. APA found that two kinds of cost pressures exist in North Carolina: (1) geographic cost differences that reflect differences in prices for consumer goods; and (2) the attractiveness of districts to teachers due to factors such as population density. While some may believe that these cost pressures offset one another, APA found that they do not necessarily do so in every county, with the result that some counties need to pay more than the statewide average salary, or could pay less than the statewide average salary, in order to attract and retain teachers with similar characteristics. In this report, APA produces both geographic cost and teacher attractiveness indices. However, should these kinds of adjustments be of interest, we suggest doing additional work, particularly in order to develop the teacher attractiveness index.

9. **Modify the way the Teacher Allotment salaries are applied**. While many district administrators support the current system of paying individual teacher salaries for eligible positions under the teacher allotment, the approach is cumbersome, requiring significant oversight and tracking of currently employed teachers. An alternative approach would be for the state to pay a total amount to each district to cover the cost of teachers based on multiplying the number of eligible teachers by a statewide average salary adjusted for a variety of district-based factors, such as ones reflecting average education level, average years of experience, geographic cost differences, and teacher attractiveness. Under this approach, each district would receive a lump sum of money, which could be used to pay teachers or, in the name of flexibility, anything the district wants.

10. **Consider modifying the structure of the Statewide Teacher Salary Schedule**. Currently, the statewide teacher salary schedule is based on two teacher characteristics: (1) education level; and (2) years of experience. Almost every school district salary schedule in the nation is based on the same characteristics although they vary in how many credits must be earned before salary is affected and how many years of experience affect salary level. Today, however, many school districts, and a few states, are examining different salary schedule structures. The basic changes being examined include replacing education level with individual professional development plans, de-emphasizing experience, adding multiple roles, levels of leadership and responsibility, and days of work, and adding alternative ways of holding teachers accountable based on student performance, formal evaluation, and individual-based student learning objectives. Our suggestion is that North Carolina consider changing the structure of its teacher salary schedule, which is the primary basis for allocating state aid to school districts.

11. **Create a "foundation" type formula** based on setting a base cost with adjustments for student characteristics and district characteristics but, unlike other states, have no expected local revenue contribution to pay the costs. This would make the school finance system in North Carolina analogous to the systems used in most other states (without the local

contribution). Additional state aid could still be provided for low wealth school districts, to promote particular programs or services of interest to the state, to provide incentives to districts to generate local funds, for transportation, and for capital purposes. This could be accomplished by adding several "tiers" to the foundation program. This final alternative is the most far-reaching because it combines several of the alternatives discussed above.

Overall, APA's conclusion is that North Carolina has paid a great deal of attention to what other states have been doing in the past several decades to recognize the cost pressures that school districts face in providing education services. The evolution of the state's allotment system for schools has been to add and remove pieces around the largest, and most basic, component of the entire system – the provision of teachers in every school district. Perhaps the greatest strength of North Carolina's current system is that, taken together, the allotments address almost all of the cost factors associated with providing education services (although the approaches used to do this could be improved).

Despite its existing strengths, however, the state's current system could benefit from several potential changes. The modifications suggested above offer North Carolina's policymakers an opportunity to revisit and renew constructive discussions around key components of the state's school finance approach, and to further improve upon a system which has continued to evolve over the past 40 years.

I. Introduction

This report was prepared by Augenblick, Palaich and Associates (APA), a Denver-based consulting firm, for the North Carolina General Assembly. APA was selected to do the work described in the report through a competitive bidding process to conduct a study of the state's school finance system. This finance system is based on a number of allotments that are used to allocate state aid to each of the state's 115 school districts. APA conducted all of the work that serves as the basis of this report between March and September 2010. That work included the following tasks:

1. Conducting an initial set of interviews with a variety of interested and knowledgeable people, including state policymakers, school district organizations, and public policy groups;
2. Reviewing the literature concerning the relationships that exist between education resources and student performance;
3. Reviewing written work that has examined North Carolina's school finance system;
4. Analyzing the equity of the revenues obtained by school districts in 2003-04 and in 2008-09;
5. Analyzing individual allotments based on the revenues they provided to school districts in 2003-04 and in 2008-09;
6. Analyzing the relationships between education resources and student performance in North Carolina in 2003-04 and in 2008-09;
7. Conducting on-site interviews with school district administrators in several school districts across the state that focused on identifying those resources districts believe have the strongest impact on student performance;
8. Developing two indices designed to reflect geographic price differences across counties and the attractiveness of counties to teachers; and
9. Preparing this report, which summarizes the work that was done, identifies strengths and weaknesses of the school finance system, and specifies a number of alternative approaches the state could use to improve the school finance system.

All of this work focused on the structure of the allotment system. By that, we mean that we were asked to examine the approaches used to allocate state aid, including the formulaic procedures, and to determine whether changes in the structures of the allotments would improve the equity and/or efficiency with which state aid is distributed without being concerned about how much aid is distributed. We understand that policymakers are interested in how much money the state spends on education and that school district administrators are concerned about some of the reductions in state

support that have been made recently – but our task was to examine the system at its current funding level and to only recommend changes that could be implemented in a cost-neutral fashion.

We understand that the existing structure of North Carolina's school finance system is shaped at its core by language in the North Carolina Constitution requiring the state to provide "by taxation and otherwise for a general and uniform system of free public schools" under which "equal opportunities shall be provided for all students."[1] As in other states, the full meaning of this broad constitutional language was left open to differing interpretations. As the final arbiters on the intent and legal implications of constitutional provisions, North Carolina's courts have played a significant and ongoing role in this regard. In fact, courts in the state have a 16 year history of deep involvement in North Carolina's public education funding policy debate.

The landmark case creating the foundation for the bulk of subsequent court decisions in North Carolina was first filed in 1994. It is typically referred to as "the Leandro" case. This case, which was decided in 1997 by the state supreme court, found that the North Carolina Constitution guarantees every child in the state, "*an opportunity to receive a sound basic education in our public schools*."[2] The court further defined the key elements that constitute a "sound basic education," including that a student must, by law, be provided with at least:

- Sufficient ability to read, write, and speak English and a sufficient knowledge of math and science to function in a complex and rapidly changing society;
- Sufficient knowledge of geography, history, and economic and political systems to make informed choices on issues that affect the student personally or affect the student's community, state, and nation;
- Sufficient skills to successfully engage in post-secondary education or vocational training; and
- Sufficient academic and vocational skills to compete on an equal basis with others in further formal education or gainful employment.

The court also held, however, that the North Carolina Constitution does not require equal funding or educational advantages in all school districts. Instead, localities are allowed to help finance their school systems and any resulting unequal funding among school districts does not, in itself, violate the constitution.

The 1997 Leandro decision did not, however, end litigation surrounding school finance issues in the state. Instead, subsequent court actions led in 2004 to an additional state supreme court ruling (known as Leandro II) further clarifying what it means to provide a "sound basic education."[3] Significant new

[1] North Carolina State Constitution, Article IX, Section 2

[2] *Leandro v. State*, 346 N.C. 336, 488 S.E.2d 249 (1997).

[3] *Hoke County Board of Educ. v. State ("Leandro II")*, 358 N.C. 605, 599 S.E.2d 365 (2004).

elements added to the original Leandro ruling included that every public school must have, at a minimum, the following:

- Quality Teachers. There must be a competent, well trained teacher in every classroom
- Quality Principals. There must be a competent, well trained principal in every school.
- Resources. Every school must have the resources necessary to meet the educational needs of all children, including at-risk children.

In addition, Leandro II held that several factors could be used by courts in the future to determine whether a "sound basic education" is being provided to students in specific school districts. Such factors could include: 1) poor standardized test scores (such as scoring below grade level proficiency on the state's standardized End of Grade (EOG) and End of Class (EOC) exams); and (2) consistent failure of students to match the academic performance of their statewide public school counterparts when examining dropout rates, graduation rates, need for remedial help, inability to compete in the job markets, and inability to compete in collegiate ranks. According to the court, the state has an obligation to examine its education-related allocations and to correct any deficiencies that prevent districts from providing a sound basic education to their students.

One of the things that makes North Carolina's school finance system unique is that almost all of the districts are fiscally dependent; that is, school districts, through school boards, do not determine their revenue levels or local tax rates, to the extent that they decide they need revenue beyond that provided by the state or the federal government. In other states, most, but not all, school districts are fiscally independent, allowing school boards to directly set revenue levels and tax rates. While we heard a variety of positive and negative comments about the value of school district fiscal control, the fact that overarching fiscal decisions are made at a level of government different from school districts did not affect our analyses or recommendations.

Throughout the report, we have attempted to explain why we undertook particular analyses and how we conducted those analyses. To some extent, because some of the chapters of the report are independent of each other, there is some duplication that we felt was necessary to avoid confusion on the part of readers who do not read every chapter.

II. North Carolina's System of Funding Public Elementary and Secondary Schools

The primary purpose for which North Carolina allocates state support to its 115 school districts is to assure that a basic level of service, including the personnel and materials needed to deliver those services, is available in every district.[4] By allocating funds to accomplish this purpose, the state is able to fulfill the state constitution's requirement that "The General Assembly shall provide by taxation and otherwise for a general and uniform system of free public schools ... wherein equal opportunities shall be provided for all students" (Article IX, Section 2 (1)).[5] The state also distributes funds to support students with special needs, such as disabled students or students at risk of failing, and to support districts with particular characteristics, such as small size or low wealth. The state uses "allotments" to distribute the vast majority of state support; allotments are formulaic procedures that use specific criteria and parameters to allocate money so that, while all districts are treated uniformly, support is differentiated based on the estimated needs of districts.

In 2009-10, the state of North Carolina appropriated $7.646 billion to support its public elementary and secondary schools, including $945.0 million for personnel benefits such as retirement. Of the remaining $6.701 billion, $6.359 billion (94.9 percent) was appropriated through the allotments (the remaining 4.1 percent was distributed through grants or procedures that were not formula-driven to support pilot programs, statewide student testing, etc.).

It is difficult to count the number of formulas that are actually used to allocate state funds because they are organized by purpose, such as to assure a basic number of classroom teachers, and several purposes use multiple, separate allotments. Ultimately, APA organized the allotments into 22 individual components, each with its own formulaic procedure, of which the largest single allotment (to pay for classroom teachers) is responsible for 46.5 percent of all funds controlled by all allotments.

Historically, the state has added new allotments to those considered to be the basic allotments in order to provide specific programs and services, such as teacher assistants or mentors, which might improve student performance. The state has also eliminated allotments that were viewed as not providing resources effectively, such as the ABC incentive award. It should be noted that in 2009-10, the state reduced the total appropriation for all allotments by $225 million (on a per student basis, which has been accounted for in the figures discussed above) and allowed districts to essentially determine how to reduce their expenditures.

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[4] There are 100 counties in North Carolina, 89 of which have a single school district; of the remaining 11 counties, seven have two districts and four counties have three districts. A few school districts are in independent cities.

[5] The North Carolina Constitution also states that "the General Assembly may assign to units of local government such responsibility for the financial support of the free public schools as it may deem appropriate" (Article IX, Section 2 (2).

None of the state's allotments requires, or is calculated based on the assumption of, a local contribution. Because school districts in North Carolina are "dependent" (that is, they do not have the authority to impose taxes of any sort), counties (and some cities) may supplement state support to whatever extent their voters choose. An important role of local tax revenue is to support the capital needs of school districts, for which a limited amount of state aid is available.

Position Allotments

Position allotments allow school districts to employ personnel up to a number specified by the state (based on student-to-personnel ratios) and to pay such personnel based on statewide salary schedules (that are based on the education level and years of experience of individual employees).

The largest single position allotment, as mentioned above, is for kindergarten through grade 12 classroom teachers. The allotment procedure is based on: 1) statewide salary schedules driven by education level and years of experience; and 2) determining the number of teachers each district could employ, based on student-teacher ratios (1:18 for grades K-3, 1:22 for grades 4-6, 1:21 for grades 7-8, 1:24.5 for grade 9, and 1:26.64 for grades 10-12, where students are counted based on average daily membership [ADM, of which there were 1,464,914 in 2009-10]). City school districts with fewer than 3,000 ADM are given a small boost in teacher staffing by rounding all partial positions up to the next full position.

School districts hire the number of teachers for which they will be reimbursed and receive payment for each one based on his/her appropriate salary. School districts can choose to hire more teachers and/or pay higher salaries than those calculated and paid under the statewide salary schedules (provided the county/city approves the budget covering such supplements). Theoretically, under this approach, the state will pay for the most expensive teachers among all those employed in each district. In 2009-10, this allotment provided $2.955 billion and supported 69,010.5 classroom teacher positions at an average salary of $42,825 each.

The state uses position allotments to pay for three other types of certified staff positions: (1) instructional support, such as librarians and guidance counselors; (2) vocational, or career-technical education; and (3) school building administrators, defined as only principals and assistant principals. For instructional support, the number of eligible employees was based on a ratio of one per 200.1 ADM (which resulted in $357 million to support 7,386.5 budgeted positions at an average salary of $48,376). For principals, the number of eligible employees was based on one per school (with at least 100 ADM or seven state paid teachers) while for assistant principals, districts were eligible to employ such a person for one month per 80 ADM (so one 10-month person per 800 ADM). The amount provided for school building administration was $262 million, which supported 4,264.1 budgeted positions for principals and assistant principals at an average monthly salary of $5,789 for principals and $5,082 for assistant principals. For career-technical education, 6,559.4 positions were allotted based on the number of ADM

in grades 8-12 with a minimum of 50 months per district. Given a total allotment of $392 million, the average monthly salary for career-technical teachers was $4,491.[6]

While the state had used allotments to support district central office administration, in 2009-10, the state allocated $107 million in funding based on reducing what had been allotted in the prior year by different percentages based on school district enrollment: 7.5 percent for districts with fewer than 8,000 ADM, 14 percent for districts with between 8,000 and 29,999 ADM, and 18 percent for districts with 30,000 or more ADM.

Dollar Allotments

Several allotments were distributed based on a fixed dollar amount per a specified number of students: (1) $1,101.94 per ADM student in grades K-3 for teacher assistants; (2) $59.82 per ADM student for classroom materials, instructional supplies, and equipment ; (3)$2.69 per ADM student in grades 8-9 for PSAT testing; (4) $40.75 per ADM student for textbooks ; (5) $7.84 per ADM student for non-instructional support personnel (such as clerical staff, custodians and substitutes) ; (6) $238.04 per 9th grade ADM for driver training; and (7) $.26 per ADM student for technology.

In addition some of the funding for students with special needs was allotted based on the numbers of such students, sometimes with a cap on the number of students: (1) $3,545.42 per child age 5 to 21 identified as being a handicapped child, up to 12.5 percent of K-12 ADM (in addition to reimbursements for group homes, foster homes and other residential programs); (2) $2,903.57 per three, four, or pre-K five year old child identified as being handicapped (on top of a base of $54,375 per district); (3) $369.14 per LEP student using a three-year weighted average count up to 2.5% of K-12 ADM (on top of a base of $28,978 – the average cost of a teacher assistant – per district plus an amount based on the concentration of LEP students [$3,300.05]); (4) $71.52 per all ADM students plus $373.61 per "poor" student (273,111 students based on the federal Title 1 count); (5) $33.51 per ADM in grades 8-12 for career-technical education program support, on top of $10,000 per district; (6) $1,173.79 per ADM student, up to four percent of all students, for academically or intellectually gifted students; and (7) a base amount of $750 per district plus 25% of any remaining appropriation is allocated equally among districts for staff development and 75% is allocated per ADM student.

An allotment for teacher mentor pay provided $756.16 per full-time equivalent teacher (based on the highest count of classroom teachers or instructional support personnel paid by state, local, or federal funds paid on steps 1 and 2 of the statewide salary schedule in the preceding three years). Each district also received the dollar equivalent of two teachers and two instructional support personnel ($230,424)

[6] All eligible personnel paid under statewide salary schedules earned benefits of $4,527 for hospitalization plus 8.75 percent of salary for retirement, and 7.65 percent of salary for federal social security (therefore, the average classroom teacher earned benefits equivalent to about 27 percent of salary).

for at-risk students, and each high school received $37,838 for the dollar equivalent of one resource officer.

Special Purpose Allotments

The state also provided allotments for four special purposes, which were more complicated than any of the allotments discussed above. Special purpose allotments include: (1) supplemental funding for at-risk students (DSSF); (2) funding for low wealth county school districts; (3) funding for small county school districts; and (4) student transportation.

The DSSF allotment is based on determining the cost of the number of classroom teachers required to reduce the student teacher ratio for students classified as low income (323,844 students based on Census data related to single parent families, mothers' education levels, etc.) to different levels than those used in allotting basic classroom teachers. This is based on the proportion of low income students compared to the statewide average (in four groups, ranging from 1:20 to 1:16, which are below the statewide average of 1:21 for all students) and multiplying the number of teachers by the statewide average teacher salary. The Disadvantaged Student Supplemental Funding allotment distributed $77 million in 2009-10.

The allotment for low wealth county school districts is based on determining the amount of revenue needed so that all districts making the statewide average school tax effort could generate the same revenue as a district with average wealth, where average wealth is based 40 percent on equalized assessed property value, 10 percent on the square mile density of the district, and 50 percent on per capita income (three year average). In the past, 70 of the state's 100 counties (including 80 of the state's 115 districts) have received a portion of the total amount appropriated ($210 million in 2009-10).

The allotment for small county school districts is provided only to county districts with fewer than 3,239 students (or those with between 3,239 and 4,080 students with lower than average property wealth) and is based on calculating the dollar equivalent of seven factors: (1) rounding up all position allotments to the next highest whole number; (2) 5.5 classroom teachers if the student density per square mile is greater than four; (3) the number of program enhancement teachers required to offer the standard course of study; (4) one teacher assistant per 400 ADM students less $2 per ADM student); (5) a minimum amount for classroom materials, supplies, and equipment; (6) career-technical education months of employment plus program support for 6th grade ADM students; and (7) additional funds to counties with less than 1,300 students. In the past, 27 districts have received funding from this allotment, which provided $46 million in 2009-10.

The allotment for transportation is based on each district's: (1) eligible spending in the prior year (state and local expenditures excluding equipment purchases and salaries paid above a statewide maximum going back to a base year some time ago); (2) "budget rating" (based on a statistical examination of spending per student transported and the number of buses operated per 100 students transported relative to student density, average distance of students from school, elevation, and percentage of students with disabilities who are transported); and (3) adjustments reflecting ADM growth and

legislative changes. The state also provides funds for bus replacement using a priority system based on mileage and age. The transportation allotment provided $381 million in 2009-10.

Capital

The state allocates monies from the Lottery for capital purposes. These funds are distributed on a per student basis with 65 percent of the funds available to all districts. Districts in counties with higher than average tax rates for all purposes are eligible for the remaining 35 percent of available funds. The state also allocates a dedicated set-aside of 7.25 percent of the State Corporate Income Tax to counties for school construction.

Charter Schools

In North Carolina, up to 100 charter schools are permitted to operate and they do so separately from any school district. Their funding is based on the average dollar equivalent of the state and local resources received by the districts from which students come. For example, if a charter school serves two students, one who comes from District A and one who comes from District B, and if in District A the average state allotment is $5,300 and the average local revenue is $1,800 and in School District B the average state allotment is $6,200 and the average local revenue is $1,400, then the charter school would collect $7,100 from District A on behalf of one student and $7,600 from District B on behalf of the second student, regardless of whether the need of each student matched the average need of the districts from which they came.

Flexibility in Using Allotted Funds

While most allotments have restrictions regarding the use of funds received, over the past few years the state has relaxed restrictions and provided more flexibility to districts (in some sense, as the level of state aid has been constrained, local flexibility has increased). Flexibility is defined in a variety of ways: (1) while the number of classroom teachers allotted is based on a 10-month year, individual teachers can be employed for as many months as desired provided the total equates to the state allotment and state class size requirements (different from the allotment ratios) are not exceeded; (2) personnel positions can be converted to dollars and used for other purposes (for example, assistant principals can be converted to teachers, supplies and materials, and/or staff development); (3) support for students with special needs is considered to be "categorical" – that is, funds can be used for a variety of different purposes (personnel, materials, programs, etc.) provided that the target population is the beneficiary of such purposes; (4) funds allocated through different allotments for the same target population can be mixed; (5) funds allotted as dollar amounts are almost completely flexible within current operating expenses; and (6) charter schools have complete flexibility over the use of state and local funds. For FY2009-11, the State Board of Education was given the authority to provide nearly complete spending flexibility to school districts.

III. Overview of Research on the Relationship between Resources and Student Achievement

Research on the relationship between school resources and student achievement has been decidedly mixed. A number of studies employing education production functions (statistical models that attempt to estimate the amount of change in student achievement resulting from a specific increase in education resources) have shown, at best, weak effects that are overshadowed by the family and economic status characteristics of individual students and their families (Hanushek, 1989; Jencks, et al., 1972). A debate over the research methods applied in these studies (Hanushek, 1996) has further muddied the waters, with studies such as Hanushek's analysis of the literature finding little or no effect of resources on student outcomes (Hanushek, 1989; Hanushek, 1997), while other similar analyses have found much more significant impacts (Hedges and Greenwald, 1996; Hedges, Laine, and Greenwald, 1994; Greenwald, Hedges, and Laine, 1996).

In his meta-analysis of 187 studies on the effects of various educational resources on student outcomes, Hanushek found only 13 of 65 studies where per pupil expenditures had a significant and positive effect (Hanushek, 1989). In a follow up analysis of 377 studies, Hanushek again found a small fraction, only 27%, of studies where the effects of per pupil expenditures were statistically significant (Hanushek, 1997). Other researchers, however, took issue with the methods Hanushek used to identify and rank the studies he included in his analyses. Greenwald, along with his colleagues, conducted a similar meta-analysis of studies of educational resources, including many of the same studies Hanushek evaluated, and came to a very different conclusion (Greenwald, Hedges, and Laine, 1996). They concluded that about half of the studies focused on per pupil expenditures had statistically significant positive effects. Their findings suggested that the relationship between resources and student achievement levels were so strong that "moderate increases in spending may be associated with significant increases in achievement" (Greenwald, et al., 1996, p. 369).

The uncertainty over the effect of resources on student outcomes may be driven largely by whether or not these resources are used effectively. Researchers now suggest that the interaction of resources with how they are used by educational staff in districts and schools constitute a "black box" in which little is known about how resource allocation decisions are made or the quality of implementation once a plan has been determined. For example, for classroom resources to positively impact student outcomes, several conditions must be met: (1) the classroom teacher must be of high quality, meaning that he or she must have a sufficient repertoire of instructional practices informed by knowledge of both content and how students learn the content; (2) the teacher must make effective use of available classroom resources such as textbooks, technology, and assessments; and (3) the school as a whole must use its resources to effectively provide a school environment supportive of teaching and learning. This may include elements such as class size, professional development, professional community, school climate, and leadership. If resources are insufficient or not useful to the learning process, or if teachers

do not know how to use them effectively, it is unlikely that resources will have a noticeable impact on student outcomes.

According to Cohen and associates (2002) several factors may explain why resources are often found to have limited effect on student learning. Most importantly, these include: (1) teachers often do not know how to make effective use of the resources available to them; (2) the available resources are insufficient to significantly improve instructional practices; or (3) the resources themselves are not useful or effective for improving learning.

Grubb (2009) elaborates on this line of reasoning suggesting that there are multiple classes of education resources, including simple, compound, complex, and abstract resources. Most, if not all, studies of the effects of education resources on student achievement look only at simple resources, such as expenditures per student, class size, or teacher salaries. However, the ineffective use of these resources may negate their potential impact. Grubb argues that these resources are "necessary but not sufficient" for supporting greater performance gains. The quality of other, less tangible resources, including how instructional time is used, the quality of curriculum and instruction, school climate, and professional culture not only may raise student achievement but may provide the capacity for making effective use of school resources. In essence, Grubb incorporated these resources into a production function model to provide evidence not only of the amount of financial resources necessary, but how effectively the resources were used to implement a quality instructional program.

Using a national, longitudinal dataset that included variables for many of the more complex educational resources he identified, Grubb found that his expanded model of the impact of school resources showed a much stronger relationship between school resources and student outcomes, between two and four times greater than when only simple resources were considered (Grubb, 2009).

These studies indicate that educational resources can positively affect student achievement, but in order to do so, they must be applied and implemented effectively. The following section presents the research on resources that are likely to have an impact on student performance if implemented effectively.

Links to Student Performance

Although research on the relationship between simple school resources such as per pupil expenditures or teacher's salaries and student achievement, has been mixed, it is possible to identify a number of specific resources or practices provided by schools or districts that are more likely than others to improve student performance.

Particular levels of these variables could also be established as minimum standards for a state, school, or district. Some states legislate minimum levels of personnel and other resources. While there is nothing wrong with defining these types of standards, the research does not provide an empirical basis for specific ratios or resource levels that can be used with any sort of precision to predict performance. Nonetheless, the factors that appear to have a moderate or strong link to student performance in the research include the following:

- Administrator professional development
- Teacher professional development
    - Instructional coaches
    - Collaboration time/structure
- Staffing ratios
    - General education teachers
    - Special education teachers
    - ESL/ELL teachers
    - Library staff
    - Nurses
    - Technology specialists
    - Counselors
- Technology
- Tutoring
- Full-day kindergarten
- Distribution of spending

While these are not all resources explicitly, they have definite resource implications. All of the factors presented in this analysis both have resource implications and an empirical basis in the research literature.

Teacher Professional Development

Professional development for teachers is widely cited in the literature as an effective means of improving teaching practice and as a consequence, improving student learning and achievement (Supovitz and Turner, 2000; Huffman, Thomas, and Lawrenz, 2003; Darling-Hammond and McLaughlin, 1999; Flecknoe, 2000; Holland, 2005). Specifically, the literature indicates that professional development for teachers may improve reading, math, and science instruction (Cohen and Hill, 1998; Greenleaf and Katz, 2004; Roseberry and Puttick, 1998; Supovitz and Turner, 2000; Huffman, Thomas, and Lawrenz, 2003). When a sample of teachers nationwide was asked to identify effective resource allocation practices in their school, 57.7 percent of the teachers identified additional professional development as an important strategy (Rudo, 2002).

Studies indicate that dramatically-improved schools and high-performing schools have rigorous professional development practices that provide critical training and support to improve teaching (Perez, et al., 2007). Principals of high-performing schools usually have a superb record of providing teacher training on-site (Carter, 2000). Schools that show dramatic improvement often report large investments in teacher training that can include intensive 1-2 week summer institutes, longer work years, and instructional coaches (Odden A. , 2007). In a multi-state study of districts that experienced rapid improvement, many of these districts increased professional development to all staff, particularly instructional staff (Bray, 2003). Indeed, a number of successful school studies indicate that high-poverty high-performing schools dedicate a higher proportion of their funds to professional development (Barth,

et al., 1999) than other schools. A mixed-method study of 12 improved school districts indicated that professional development helped to support teacher success through such practices as the use of individual growth plans, evaluations, and new teacher mentoring (Pan, Rudo, Schneider, and Smith-Hansen, 2003).

The research indicates that professional development may be most effective when it is sustained over longer periods of time, suggesting that repetition improves teacher learning and instructional practices (Cohen and Hill, 1998; Darling-Hammond and McLaughlin, 1999; Augenblick and Kramer-Wine, 2008; Supovitz and Turner, 2000). Other studies recommend that professional development be designed for teachers in the same school so that they can work together toward the attainment of common goals (Maldonado, 2002).

It may be possible for many schools and districts to improve the focus and quality of professional development by using instructional coaches, common teacher planning time, or offering training on-site. According to the research, professional development should be focused on improving teachers' ability to meet school or district goals. This requires high-quality, focused professional development that aligns with performance standards, curriculum, assessment, and instruction. "Research suggests that professional development should be tied to student improvement, linked with standards, and integrated into teachers' daily work" (Picucci, Brownson, Kahlert, and Sobel, 2002).

Instructional Coaching

Instructional coaching is one means of providing professional development to teachers. Coaching may be particularly helpful for new or inexperienced teachers. Research suggests that mentoring for new teachers may increase retention and help teachers develop effective teaching strategies more quickly as they learn from more experienced teachers (Holloway, 2001; Newcombe, 1988; Walker, 1992). Instructional coaching is also likely to help more experienced teachers. Several studies conclude that instructional coaching improves the use of new instructional methods in the classroom (Showers and Joyce, 1996; Knight, 2004). Other studies report that coaching may improve teacher communication, collaboration, and satisfaction (Makibbin and Sprague, 1997; Neufield and Roper, 2002). Coaches can help teachers improve the alignment between teachers' instruction and school goals (Carter, 2000). Principals of high-performing schools often report the use of literacy and math coaches to help guide instruction (Perez, et al., 2007).

Teacher Collaboration

A strategy similar to instructional coaching is teacher collaboration. In creating a culture of accountability for achievement, teacher collaboration helps to create a common vision for teachers. A study of high-performing high-poverty schools concluded that collaborative planning time was a factor that attracted teachers to their school initially and encouraged the teachers to remain at the school (DeCesare, Kramer-Wine, and Augenblick, 2008). This planning time allows teachers to problem solve and brainstorm together on how to improve student achievement and minimize discipline problems (Picucci, Brownson, Kahlert, and Sobel, 2002; Johnson and Asera, 1999). Teacher collaboration can also help create a sense of shared accountability for success (Trimble, 2002). Finally, teacher collaboration

allows teachers to discuss and plan the curriculum, align instructional practice, and review student assessment data (Perez, et al., 2007). Options for increasing collaborative planning time include duty-free schedules, the use of electives as planning periods, late start days or early dismissal days, and the use of substitutes (DeCesare, Kramer-Wine, and Augenblick, 2008).

Clearly, the amount of and type of professional development provided to teachers has resource implications for the school. Although the research indicates that professional development should be sustained over time, it is impossible to define what amount of professional development is necessary across schools or districts to improve performance or sustain high performance.

Administrator Professional Development

Research suggests that principals can improve student academic gains through effective school governance, building collaborative relationships, and organizing effective work patterns (Gullatt and Lofton, 1996). In order to effectively enhance teacher quality and improve the use of data to inform instruction, the ability of principals and assistant principals to be effective instructional leaders is important. Communicating clear, high goals and sharing decision-making with teachers may be especially crucial for school administrators in turning around low-performing schools or maintaining consistently high student performance (Leithwood, Seashore Louis, Anderson, and Wahlstrom, 2004; Picucci, Brownson, Kahlert, and Sobel, 2002; Waters, Marzano, and McNulty, 2003; Craig, et al., 2005; McGee, 2003; Odden A. , 2007).

In a study of California schools that beat the odds, 11 out of 18 schools had a dominant principal who set high expectations, provided teachers with the help they needed to be successful, and dealt effectively with teachers who did not meet expectations (Perez, et al., 2007). The research suggests that there are two ways to bring about dramatic change in low-performing schools: 1) bringing in new school administrators or, 2) changing the leadership practices of existing school administrators (Herman, Dawson, Greene, Maynard, and Darwin, 2008). Bringing new principals into a school may be an effective way to initiate dramatic changes in leadership, but it may also be possible to improve the skills of existing administrators through professional development (McGee, 2003; Herman, Dawson, Greene, Maynard, and Darwin, 2008; Johnson and Asera, 1999).

Well-structured professional development can help principals develop the necessary skills to promote a positive school culture. In addition, professional development may keep principals informed about effective instructional practices and provide information on curriculum development. According to the National Staff Development Council, effective professional development programs for principals should be long term, carefully planned, job-embedded, and focused on how to improve student achievement (2000). Other important components of effective professional development for school administrators are opportunities for reflection, problem solving work, and collaborative work with other principals (Bottoms, O'Neill, Fry, and Hill, 2003; Barth R. , 1986; Evans and Mohr, 1999; Peterson, 2002). Like teachers, principals, especially new principals, may benefit from mentor programs (Whitaker, 1995). Principal-leadership academies, usually held during intensive summer workshops, work to improve principals' leadership abilities (Barth R. , 1986; Peterson, 2002). It is important that principals, assistant

principals, and other key school and district leaders have ongoing opportunities to improve their skills and abilities.

Staffing Ratios

Over the years, there have been a plethora of studies on staffing ratios. While the research provides some guidance on staffing ratios that are likely to be beneficial, there is very little conclusive guidance on the *precise* ratios that are likely to be beneficial for student achievement. Studies also do not address the trade-off between numbers of teachers and teacher characteristics.

General Education Teachers

There is a wide body of literature documenting the positive impact of small class sizes for students in grades K-3. Specifically, the research documents that smaller classes are especially beneficial for reading and math achievement and for low-income and minority students (Robinson, 1990; Achilles, 1999; Gerber, Finn, Achilles, and Boyd-Zaharias, 2001; Grissmer, 1999; Nye, Hedges, and Konstantopoulos, 2002; Finn and Achilles, 1999; Miller, 2002).

An early meta-analysis of class sizes studies was completed by Glass and Smith in 1979. This meta-analysis concluded that class sizes of 20 students or fewer can have a positive effect on academic achievement (Glass and Smith, 1979). An evaluation of a class size reduction policy in Indiana documents the positive impacts of class sizes of 15 students or less (Chase, Mueller, and Walden, 1986).

Probably the most influential study to date is the Tennessee Project STAR, a large-scale randomized study of students in grades K-3. Data from this study indicated that students in classes with 13-17 students outperformed students in classes with 22-26 students, even when the larger classes added an instructional aide (Word, et al., 1990; Gerber, Finn, Achilles, and Boyd-Zaharias, 2001). Subsequent analysis of STAR data has shown that small classes in the early grades produce lasting benefits for students, such as higher high school graduation rates (Krueger and Whitmore, 1998; Cohen, Miller, Stonehill, and Geddes, 2000; Egelson, Harman, Hood, and Achilles, 2002; Finn, Gerber, and Boyd-Zaharias, 2005; Nye, Hedges, and Konstantopoulos, 2002). While the research on class sizes in the early elementary grades is substantial, there is little or no research to suggest that small middle or high school class sizes are beneficial to student performance. According to Odden et. al., (2005), most comprehensive school reform models propose class sizes of 25 or less (Stringfield, Ross, and Smith, 1996; Odden A. , 1997).

There appears to be justification for maintaining smaller class sizes and student-to-teacher ratios in kindergarten through 3rd grade. At least one author found that smaller classes not only improved student achievement, but also were more cost effective than regular classes with aides (Grissmer, 1999). However, the recommended class size and student-to-teacher is still subject to debate.

Special Education Teachers

A number of studies document the positive impact of smaller student-to-teacher ratios and smaller class sizes on the academic outcomes of special education students (Thurlow, Ysseldyke, Wotruba, and Algozzine, 1993; Keith, Fortune, and Keith, 1993; Keith, Keith, Young, and Fortune, 1993). Special

education students often require more personal attention than general education students. Specifically, one study found that special education students were likely to spend more time engaged and teachers were more active and adaptive when student-to-teacher ratios were lower (The Council for Exceptional Children, 1989). A Virginia study concluded that special education students in smaller classes achieved at higher levels in reading, math, and social studies than their peers in larger classes (Keith, Fortune, and Keith, 1993). Researchers in New York reported that larger special education classes were associated with less time spent on academics and higher incidences of acting out (MAGI Educational Services, 1995).

Unfortunately, information on the optimal student-to-teacher ratio for special education students is relatively sparse. One of the few available studies compared special education student-to-teacher ratios of 1-to-1, 3-to-1, 6-to-1, 9-to-1, and 12-to-1 and found that academic engagement, task completion, task success, and instruction were both significantly better under lower ratios (Thurlow, Ysseldyke, Wotruba, and Algozzine, 1993). Another study on class size and special education students concluded that although students performed better under lower ratios, there was no magical student-to-teacher ratio that should be recommended (McCrea, 1996).

ESL/ELL Teachers

Research on class size and student-to-teacher ratios for limited-English-proficient (LEP) students is similar in nature to the research for general education students, although the research base for LEP students is considerably smaller. That is, the limited research generally suggests that lower class sizes and student-to-teacher ratios are beneficial, but does not reach any conclusions about optimal sizes or ratios.

For example, programs such as Éxito Para Todos, the bilingual adaptation of Success for All "increases chances of academic success by reducing student-to-teacher ratio" (Slavin and Madden, 1999). Another study found that smaller class sizes with less pull-out time positively impact the oral proficiency of ESL students in first grade (Oberg, 1993). A Texas evaluation of high performing ESL students showed an average student-to-teacher ratio of 24-to-1 (Texas Education Agency and Texas AandM University, Corpus Christi, 2000). Thus, the research offers little if any guidance for the appropriate student-to-teacher ratios for LEP students.

Library Staff

The literature indicates that a qualified library media specialist, a larger library staff, and a library staffed for more hours may improve test performance, grades, reading comprehension, research skills, and the ability to express ideas effectively (Baumbach, 2002; Baxter and Smalley, 2003; Lance, 1994; Haycock, 1995; Lance, Rodney, and Hamilton-Pennell, 2000; Smith, 2001). Specifically, the research recommends that each school library have at least one full-time certified library media specialist and one full-time support staff member (Baumbach, 2002; Smith, 2001). Another study provides evidence that students from high schools with library media teachers display better research skills in college than students from high schools without library media teachers (Smalley, 2004).

Nurses

Research on school nurses indicates that lower student-to-nurse ratios are likely to have positive impacts on student well-being (Bradley, 1998; Fryer and Igoe, 1995; Guttu, Engelke, and Swanson, 2004). An evaluation in Missouri found that as student-to-nurse ratios improved, the length of time spent in the health center decreased and more students could return to class afterwards (Igoe, 2002). In a 2003 meta-analysis, school nursing strategies that were targeted at specific student populations had positive effects on student academic performance (Maughan, 2003). A Seattle study concluded that students who were able to receive health care at school demonstrated more classroom attentiveness (Barkan, Pfohman, and Bolan, 2004). Furthermore, this study indicated that school health clinics helped reduce absenteeism, the number of dropouts, and helped improve school safety, student performance, substance abuse problems, and pregnancy rates (Bradley, 1998).

Technology Specialists

The research identifies a technology specialist as an integral component of computer and information technology programs in schools (Beglau, 2005; Dexter, Seashore, and Anderson, 2003; Stringfield, Ross, and Smith, 1996; North Central Regional Educational Lab, 2005; Wenglinsky, 2005). A technology specialist typically troubleshoots technology problems, maintains technology, and trains teachers in how to integrate technology into their instruction (North Central Regional Educational Lab, 2005). Studies have found this training to be important to how teachers use technology in their classrooms (Becker, 1994). The research suggest that it may be advantageous for each school to employ at least one full-time technology specialist to facilitate technology use in the school, address technology problems, and provide technology-related professional development (Odden, et al., 2005).

Counselors

The literature consistently documents the positive impact counselors can have on student academic performance and behavior at all school levels (Gerler, 1985; Prout and DeMartino, 1986; St. Clair, 1989; Lapan, Gysbers, and Petroski, 2001). Specifically, a number of studies conclude that school counseling may decrease inappropriate behavior, improve student-teacher relationships, and improve students' ability to stay on task (Baker and Gerler, 2001; Lapan, Gysbers, and Petroski, 2001; Watts and Thomas, 1997). Counselors may also help to improve students' social skills, self-awareness, and other developmental skills (Borders and Drury, 1992; Litrell, Malia, and Vanderwood, 1995; Verduyn, Lord, and Forrest, 1990; Schlossberg, Morris, and Lieberman, 2001). A recent study used regression models to investigate the relationship between student-to-counselor ratios and student discipline. The study found significant substantial decreases in discipline problems as the ratios decreased (Carrell and Carell, 2006). Reductions in discipline problems were especially pronounced among black male students and low-income students (Carrell and Carell, 2006).

Academically, several studies have found that counselors helped students improve their grades (Gerler, 1985; Watts and Thomas, 1997; Lee, 1993). The influence of counselors may continue beyond high school. Research has concluded that counselors help students define career plans, increase their aspirations, and reduce drop-out rates (Beardan, Spencer, and Moracco, 1989; Lapan, Gysbers, and

Petroski, 2001; Kaufman, Kiein, and Frase, 1999; Mau, Hitchcock, and Calvert, 1998; Whiston and Sexton, 1998).

Technology

Studies have demonstrated that the use of educational technology can motivate students and teachers, enhance instruction for special needs students, and improve student attitudes toward learning (Bialo and Sivin-Kachala, 1996). In fact, educational technology may have a positive effect on achievement in all major subject areas, from pre-kindergarten through secondary school, and for regular and special needs students (Bialo and Sivin-Kachala, 1996). A meta-analysis of 700 empirical research studies found that access to educational technology was positively associated with student gains on a variety of exams (Mann, Shakeshaft, Becker, and Kottkamp, 1999a; Mann, Shakeshaft, Becker, and Kottkamp, 1999b; Schacter, 1999). One study of New York schools found that schools that had more instructional technology and more technology-related training for teachers experienced larger Regents' exam increases in math and reading than other schools (Mann and Shafer, 1997). Computer access and sufficient instructional software are positively linked to academic achievement (Bialo and Sivin-Kachala, 1996; Lederman, 1995; Kulik, 1994; Mann, Shakeshaft, Becker, and Kottkamp, 1999a; North Central Regional Educational Lab, 2005; Wenglinsky, 1998).

The research indicates that it is essential for students to have regular access to well-maintained and up-to-date computers and other educational technology in order to improve performance, engage students in learning, and prepare students to use technology outside of school.

Tutoring

There is a great deal of research documenting the positive impact of one-on-one or small group tutoring at the elementary school level. A 1982 meta-analysis of 65 studies found that tutoring programs had positive effects on the academic performance and attitudes of tutored students (Cohen, Kulik, and Kulik, 1982). Smaller-scale evaluations of elementary school tutoring programs produced similar results. Fashola and Cooper (1999) and Wasik and Slavin (1993) studied nine different language arts tutoring programs and found positive effects on spelling, word recognition, reading comprehension, and vocabulary (Fashola and Cooper, 1999; Wasik and Slavin, 1993). Tutoring also may help students improve in math (Al Otaiba, Schatschneider, and Silverman, 2005; Shanahan and Barr, 1995). Many effective tutoring programs are aimed specifically at helping at-risk students, including students who are not achieving standards, disadvantaged, mildly disabled, or may have limited English proficiency (Morris, 1995; Al Otaiba, Schatschneider, and Silverman, 2005; Bender, Giovanis, and Mazzoni, 1994; Fashola and Cooper, 1999; Fowler, Lindemann, Thacker-Gwaltney, and Invernizzi, 2002; Shanahan and Barr, 1995).

Several studies conclude that tutoring programs using certified teachers are likely to have larger effects on student achievement than programs using paraprofessionals (Al Otaiba, Schatschneider, and Silverman, 2005; Wasik and Slavin, 1993). Other research indicates that the most effective tutoring programs are highly structured, integrated with classroom subject matter, and use tutors with subject matter expertise and the ability to speak to students at their comprehension level (Cohen, Kulik, and Kulik, 1982; Barrows, 1988; Schmidt, 1994; Schmidt, Ahrend, Kokx, and Boon, 1993; Wasik and Slavin,

1993). It is far more likely that certified teachers possess these skills and the ability to construct lesson plans than a paraprofessional or volunteer. The research also suggests that students who meet more frequently with tutors are more likely to show academic improvement (Reisner, Petry, and Armitage, 1990).

Full-day Kindergarten

Recent studies indicate that students attending full-day kindergarten are likely to make more progress and achieve at higher levels than students in half-day programs (Cryan, Sheehan, Wiechel, and Bandy-Hedden, 1992; Fairfax County Public Schools: Office of Program Evaluation, 2004; Hough and Bryde, 1996; Plucker, Spradlin, Magaro, Chien, and Zapf, 2007; Walston and West, 2004; WestEd , 2005).

A nationwide study conducted by the National Center for Education Statistics found that full-day kindergarteners make greater gains in math and reading even after controlling for race, income, gender, class size, and several other factors (Walston and West, 2004). One meta-analysis of 23 studies on full-day kindergarten found that such programs accounted for 60% of the variance in student outcome measures (Fusaro, 1997). Other research indicates that full-day kindergarteners tend to perform at higher levels in literacy and mathematics as measured by standardized tests and grades (Elicker and Mathur, 1997; Fairfax County Public Schools: Office of Program Evaluation, 2004; Plucker, Spradlin, Magaro, Chien, and Zapf, 2007).

Some studies suggest that the academic benefits of full-day kindergarten persist through subsequent years (Elicker and Mathur, 1997; Fairfax County Public Schools: Office of Program Evaluation, 2004; WestEd, 2005). There is also evidence that low-income, minority, or LEP students may benefit even more from enrollment in full-day kindergarten than other students (Fairfax County Public Schools: Office of Program Evaluation, 2004; Plucker, Spradlin, Magaro, Chien, and Zapf, 2007). In addition to the academic benefits, full-day kindergarten may lead to more positive emotional, behavioral, and social outcomes for students (Cryan, Sheehan, Wiechel, and Bandy-Hedden, 1992; Hough and Bryde, 1996) (WestEd, 2005).

Distribution of Resources

In a study of 12 districts that showed dramatic improvement, these districts spent a higher proportion of their spending on instruction, core expenditures, and the number of employed teachers than lower-performing districts (Pan, Rudo, Schneider, and Smith-Hansen, 2003). The study defined 'core expenditures' as those resources used for instruction, student support services (health, attendance, guidance, and speech), and instructional staff support services (curricular development, in-staff training, and educational media, including libraries). A number of the schools included in the study also made intentional efforts to increase the time spent on instruction during the school day.

Instructional Time

The literature reveals that high-performing schools often structure their school day to create additional instructional time (McGee, 2003; Picucci, Brownson, Kahlert, and Sobel, 2002; Joint Legislative Audit and Review Commission of the Virginia General Assembly, 2004; U.S. Department of Education, 1999). For

example, in a study of high-poverty high-performing middle schools, the majority of studied schools offered some variation of block scheduling, which allowed for more in-depth teaching and additional planning time for teachers (Picucci, Brownson, Kahlert, and Sobel, 2002). According to one researcher, if properly implemented, block scheduling can improve school climate and student achievement (Rettig and Canady, 1999). A study examining schools that closed the achievement gap also found that these schools used creative scheduling such as team teaching to minimize transition time between classes and activities (Craig, et al., 2005; Hirsch, 2006; McGee, 2003).

Another way that high-performing schools create additional instructional time is to offer instruction outside of the regular school day. This may be particularly important for disadvantaged students who may face significant challenges outside of school. Seventy-eight percent of high-performing high-poverty schools in one study provided extended learning time emphasizing basic reading, writing, math, and science skills (Barth, et al., 1999). In addition, 81 percent of these schools reported having a comprehensive system in place for monitoring progress and providing early support for students who were struggling, during or outside of the school day (Barth, et al., 1999). Summer school and Saturday school are other strategies for extending instructional time in reading and math in schools that have reduced the achievement gap or beat the odds (McGee, 2003; Perez, et al., 2007). These types of interventions may also provide support for the teachers who regularly teach struggling students (DeCesare, Kramer-Wine, and Augenblick, 2008).

Since teachers are responsible for implementing many of the school-level resources and strategies, it is important to examine whether there are characteristics, types of preparation, or programs that make an impact on teacher quality and student achievement. The following section presents an overview of the research literature on teachers and their impact on student performance.

Teacher Characteristics and Student Achievement

The evidence from research strongly suggests that teacher quality may be the single largest determinant of how well students learn (Sanders and Rivers, 1996; Aaronson, Barrow, and Sanders, 2003). Sanders, who pioneered the Tennessee Value-Added Assessment System, went so far as to state that "… differences in teacher effectiveness is the single largest factor affecting academic growth of populations of students" (Sanders, 2000).

A number of studies over the past two decades have examined the relationship of various teacher characteristics to teacher quality and student achievement in an attempt to explain differences among teachers that make some more effective and others less so. In particular, studies have focused on the impact of teachers' years of teaching experience and educational attainment, the two factors upon which the salary level of nearly all teachers is determined under the standard teacher salary schedule. These studies have generally concluded that observable teacher attributes, including experience and educational attainment, have little effect on student outcomes (see for example: (Kane, Rockoff, and Staiger, 2006; Rivkin, Hanushek, and Kain, 2005; Aaronson, Barrow, and Sanders, 2003; Goldhaber and Brewer, 1997)). Other factors examined in the literature include teacher certification, teachers' verbal

ability, performance on assessments of basic skills, and the quality of their degree-granting colleges and universities.

Teacher Certification

Traditionally, teacher certification has served as the primary assurance of some level of teacher quality (Rice, 2003). Virtually every state requires nearly all of its public school teachers to be certified, either through traditional university-based certification programs or through an increasing number of alternative preparation programs, such as Teach for America (National Research Council, Committee on the Study of Teacher Preparation Programs in the United States, 2010). However, studies of the effects of certification on student achievement have revealed a weak relationship at best.

Much of the research examining the effects of certification on teacher effectiveness has compared the test scores for students of teachers with and without traditional certification. The results of these studies have, for the most part, found no statistically significant differences between certified and uncertified teachers other than for high school math (Goldhaber and Brewer, 2000).

This research includes studies of the differences in student test scores for students of teachers with subject-specific certification, emergency or probationary certification, or no certification at all. These findings suggest that for elementary teachers and for teachers of reading and science at both the elementary and secondary levels, certification status has no discernable effect on student outcomes (Goldhaber and Brewer, 2000; Rowan, Correnti, and Miller, 2002; Sharkey and Goldhaber, 2008). However, two studies by Goldhaber and Brewer using data from a national dataset (Goldhaber and Brewer, 1997; Goldhaber and Brewer, 2000) found that students of secondary teachers with certification in mathematics scored up to 10 points higher on standardized math assessments. Another study, also working with a nationally representative dataset, found no effect in either math or reading from having a subject specific certification (Rowan, Correnti, and Miller, 2002).

An unexpected finding from two studies by Goldhaber (Goldhaber and Brewer, 2000; Sharkey and Goldhaber, 2008) showed that high school students of teachers with emergency or provisional certifications did as well or better on math assessments than students whose teachers held a standard certification. These findings were challenged by Darling-Hammond, Barry and Thoreson (2001) who argued that teachers with emergency or provisional certifications are often highly experienced teachers who hold a full certification in another subject, and are therefore as well-prepared as teachers holding the appropriate certification in the subject area. The authors of the 2008 study (Sharkey and Goldhaber, 2008) also cautioned that their finding must be interpreted with care as only 19 teachers with emergency or provisional credentials were included in the study.

With the growth in alternative pathways to certification, researchers have turned their attention to assessing how teachers with alternative certification compare to those with standard certification. Among the findings of these studies is that alternative certification programs have been helpful in addressing teacher shortages in hard to serve districts and in the preparation of minority teachers (Boyd, Goldhaber, Lankford, and Wyckoff, 2007; Shen, 1997). Studies also suggest that in general,

teachers prepared via alternative pathways do not differ significantly from traditionally certified teachers in terms of their effectiveness as assessed by teacher evaluations or by the performance of their students on standardized assessments (Boyd, Goldhaber, Lankford, and Wyckoff, 2007; Kane, Rockoff, and Staiger, 2006).

Some research indicates that teachers prepared through alternative programs may perform somewhat less well early in their careers, but because they tend to have somewhat higher general qualifications (such as attending more selective schools, scoring higher on the SAT/ACT, or majoring in subject specific areas such as math or science), they overcome their lack of pre-service preparation and catch up over time to their peers with standard certification (Boyd, Goldhaber, Lankford, and Wyckoff, 2007).

However, researchers warn that care must be taken in interpreting research results on certification and preparation programs. First of all, research shows that there is significant variability in the rigor of preparation programs and the selectivity of their entrance requirements. Therefore, some programs may produce much more highly qualified teaching candidates than others. Further, because teachers are not typically randomly assigned to their students, it is not uncommon for the most experienced and best educated teachers to be assigned to higher performing students, further contributing to potentially skewed research results (Boyd, Goldhaber, Lankford, and Wyckoff, 2007). Finally, a study of teachers working in the New York City public schools found that large variations among teachers *within* certification categories existed, contributing to the uncertainty when making generalizations about the effects of certification status.

Experience and Educational Attainment

A number of studies have examined the effects of years of experience and educational attainment on teacher effectiveness because these two factors are the most readily available and most used indicators of teacher quality. Further, all but a handful of school districts around the country pay their teachers using the single teacher salary schedule, which bases salary increases exclusively on increasing years of experience and degree credits. Yet, studies of both of these characteristics have been inconclusive, with most studies finding no, or small to moderate positive effects on teacher effectiveness in limited circumstances.

Increasingly, research seems to indicate that teacher experience may affect student achievement more at particular stages of a teacher's career than others (Rice, 2003). However, part of the inconsistency of these findings may stem from how teacher experience is quantified. Most studies do not specify whether their experience data represents the total number of years a teacher has been teaching, or only the number of years of teaching in the current district. The former is the more appropriate variable. But if studies use data reported by district's data systems, in many cases the years of experience may be undercounted (Rice, 2003).

Taken as a whole, research indicates that the effects of teaching experience may vary over the career of a teacher. Studies looking primarily at the impact of teaching experience have found that experience has the greatest effect during the first five to seven years of teaching, when a teacher is, in most cases,

learning his or her profession on the job. This effect then lessens until later in a teacher's career, around 15 years and later (Ferguson and Ladd, 1996; Murnane and Phillips, 1981). Ferguson (1991) found positive effects of teaching experience for up to five years in elementary schools, but also for teachers with nine years or more of experience in high schools, suggesting that experience plays a greater role in teacher effectiveness at the high school level. In the same study, Ferguson estimated the effect of experience as explaining more than 10 percent of the variation in reading and math scores for students in 900 Texas school districts.

A multi-year study of teachers in the San Diego Unified School District examined, among other things, whether the effect of years of teaching experience varied by subject area (Koedel and Betts, 2009). These researchers analyzed teacher value-added data in reading, math, and social studies for more than 16,000 elementary school students and 1,000 teachers from the 1998-99 through 2001-02 school year. They found that experience had no measurable effect in reading or social studies, but did have a moderate effect on math test scores.

Similarly, research on the effects of educational attainment, or advanced degrees, on teacher quality has been inconclusive. In general, studies have found that degrees in education, even advanced degrees, have little effect, while earning a degree in certain subject areas such as math or science may have a limited impact on student test scores (Koedel and Betts, 2009).

Two studies by Goldhaber (Goldhaber and Brewer, 1998; Sharkey and Goldhaber, 2008) looked at the effects of degrees on teacher performance at the high school level using a nationally representative database. These studies, which controlled for other school, student and teacher characteristics, found that earning a degree in education actually correlated negatively with student performance. The 1998 study found that possessing a Bachelors or Masters degree in a specific subject area (the authors' data included teachers of English, math, science, and history) had a very slight positive effect, with math having the greatest overall effect, although still small. Conversely, the 2008 study found no effect for holding a Masters degree in any subject.

The authors of the San Diego study also examined the effects of educational attainment and found that possessing a Bachelors degree in a social sciences subject area positively impacted their students' test scores in social studies, but having a Bachelors degree in the other subject areas of reading or math, or having earned a Bachelors or Masters degree in education, had no effect on student performance on standardized tests (Koedel and Betts, 2009).

Other Teacher Characteristics

While certification, teaching experience and educational attainment are perhaps the most frequently noted indicators of teacher quality, other characteristics examined in the literature include teachers' performance on assessments of verbal ability and basic skills and the selectivity of their post-secondary degree-granting and preparation programs. The following section summarizes the research on these measures of teacher quality.

Several studies have examined the impact teachers' performance on basic skills and other state tests has on their effectiveness as teachers. As of 2003, 42 states required some sort of testing as part of their certification requirements for teachers (Rice, 2003). These tests range from state-developed basic skills tests or the Praxis I assessment from the Educational Testing Service (ETS), to more specialized tests designed to measure subject-specific content and pedagogical content knowledge. Forty-seven states have elected to use one or more tests from the ETS Praxis series of assessments (also known as the National Teacher Examination), ranging from basic skills to subject specific instruments (Educational Testing Service). Nevertheless, the evidence is inconclusive as to how well these tests predict teacher effectiveness (Guyton and Farokhi, 1987; Sheehan and Marcus, 1978; Strauss and Sawyer, 1986). At best, these assessments are weak predictors of teachers' effectiveness in producing higher student outcomes.

The evidence is most supportive of the relationship between teachers' performance on tests of verbal ability and teaching effectiveness. For example, a re-examination of the teacher data collected in the 1960s for the study of *Equality of Educational Opportunity* (also known as the *Coleman Report*) found that teachers who scored higher on assessments of verbal aptitude had a positive effect on the achievement gains of their students (Ehrenberg and Brewer, 1995). This effect was evident at the elementary and secondary levels and for both white and black students. These findings were supported by the results of two studies of 150,000 Texas teachers in grades five through 11, which also found a significant positive relationship between teachers' scores on tests of verbal ability and their students' gains on reading assessments (Ferguson, 1991; Ferguson, 1998).

In contrast, a study by Murnane and Phillips (1981) that examined the academic outcomes of inner-city black students found no relationship between teacher verbal ability scores and the vocabulary scores of elementary school students. However, this study differed from the others by using a self-administered test of verbal ability rather than a state or national test used for certification purposes.

Researchers have also looked at whether teachers who graduated from more highly-rated post-secondary schools and teacher preparation programs were more effective than those from less selective programs. Again, their findings suggest that the relationship is slight and the effects may only be apparent under certain circumstances.

A study of nearly 1,900 students in grades six, eight, and twelve from a single urban district found that the students of teachers who attended more selective colleges and universities had higher test scores than those whose teachers attended less selective schools (Summers and Wolfe, 1975). While the effect was small, it was most pronounced for low-income elementary students.

Ehrenberg and Brewer (1995) found that the selectivity of teachers' undergraduate schools had a positive effect on test scores of white and black students, but not for Hispanic students. However, another study of primarily black, low-income elementary students found no effect on test scores from the selectivity of their teachers' post secondary institutions (Murnane and Phillips, 1981).

The recent study of 1,000 teachers in the San Diego school district analyzed the effect of a number of observable teacher characteristics on student performance, including whether teachers had graduated from a top 100 university as an undergraduate (Koedel and Betts, 2009). The authors found a slight negative effect on math test scores and a slight positive effect on reading scores. However, neither result was statistically significant.

Alternative Compensation Plans and Student Achievement

A small, but increasing number of school districts have adopted teacher pay plans that depart from the single salary schedule based on years of experience and educational attainment. In these plans, teachers are instead paid on the basis of the specific knowledge and skills they acquire, for accepting added responsibilities, working in hard-to-serve schools or teaching positions, or for increasing their students' levels of achievement. The guiding theory behind these alternative forms of compensation is to provide targeted incentives for teachers to increase student performance directly or to acquire knowledge and skills aligned with district priorities that are expected to lead to better student outcomes (Heneman, Milanowski, and Kimball, 2007; Odden and Kelley, 2002). In other words, these plans attempt to align teacher compensation, the single largest school district expenditure, with student achievement and other district goals and priorities.

Because the majority of alternative pay plans have been in effect for a relatively short period of time, they have generated few studies of their effectiveness. Much of the available research has focused primarily on the effects these programs have on teacher attitudes, motivation, collaboration, or sense of efficacy. Until recently, few studies had delved into these plans' impact on student outcomes. As a result, at this point in time there is relatively little research evidence on the impact of these compensation reforms on student outcomes, either positive or negative. The following section presents the available research on the effects of performance pay and knowledge and skill-based pay systems. We do know that there is little evidence that current compensation practices are positively related to teacher quality or student achievement (Hanushek and Rivkin, 2004).

Performance Pay

An increasing number of districts and states are experimenting with teacher performance pay, under which some portion of teachers' compensation is based on how well their students perform on state standardized tests. These plans generally take the form of bonuses that are paid to teachers on top of their regular salary. Alternatively, plans may also pay school-based bonuses to all teachers for meeting school performance goals.

Two of the most recent studies evaluated the effects of two teacher performance pay pilot programs in Texas, the Governor's Education Excellence Grant (GEEG) Program and the Texas Educator Excellence Grant (TEEG) Program (Springer, et al., 2009a; Springer, et al., 2009b).

The GEEG grant program was a federally and state funded three-year grant program for designing and implementing performance pay programs in schools that ran from 2005-06 to 2007-08. The grants were available only to high poverty schools and were ultimately implemented in 99 high poverty, low-

performing schools (Springer, et al., 2009a). Under the pilot, bonuses were paid to teachers based largely on state assessment scores, and individual bonuses could be based on both individual and school-wide performance. However, because each school designed its own program within the parameters of the state statute, the specific design of the pay systems varied from school to school. Under most of the schools' plans, the maximum bonus was less than $3,000. The research team found that the pilots reduced teacher turnover in the first year of the grant program. However, they failed to find any strong effects on student achievement, with effects ranging from small negative or positive effects to no effect at all (Springer, et al., 2009a).

Similar results were found in the evaluation of the TEEG grant program. This program provided grant funds to support the development of school performance pay plans between the 2006-07 and 2009-10 school years. During this time, the program funded 1,000 low-income, but high-performing schools. Similar to the GEEG grant program, state standardized test scores were the largest determinants of teacher bonuses, with teacher collaboration constituting a second mandatory criterion. While specific indicators of collaboration varied by school, the typical measurement consisted of the number of collaborative activities teachers engaged in, such as mentoring or analyzing student data, or the amount of time spent on these activities. The maximum award amount in most schools under this program was less than $3,000 (Springer, et al., 2009b).

An evaluation by Springer, et al. (2009b) found that this program also had a positive impact on teacher turnover, but the effects were not systematic. Generally, they found that larger bonuses had a larger positive impact on turnover. And, like the GEEG program, they did not find any strong evidence of systematic effects on student achievement.

An evaluation of performance pay plans implemented in five low performing elementary schools in Little Rock, Arkansas between 2004 and 2007 produced somewhat more positive results (Winters, Greene, Ritter, and Marsh, 2008). Under the Achievement Challenge Pilot Project (ACPP) grant program, funding was provided to support teacher bonuses based on student growth in math, reading, and language arts. The bonuses, which ranged from $1,800 to $8,600 per teacher, were paid directly to teachers based on their students' spring-to-spring gains on a composite score of the Iowa Test of Basic Skills.

The researchers found that there was a statistically significant relationship between schools participating in the performance pay pilot program and higher test scores, with students in these schools performing slightly better than students in non-participating schools. They also found that the greatest gains in the participating schools were for those teachers who were the least effective prior to implementation of the pilot program (Winters, Greene, Ritter, and Marsh, 2008).

The Denver ProComp pay plan, implemented district-wide in 2006, is perhaps the most extensive remaking of teacher compensation in the country. Under ProComp, the district departed completely from the standard single salary schedule for all new teachers and for those experienced teachers opting into the system. In place of the single salary schedule is a system incorporating elements of knowledge

and skills-based and performance pay plans, consisting of both individual teacher and school-wide bonuses (Gonring, Teske, and Jupp, 2007).

Unfortunately, the only evaluation of the ProComp plan to date was produced after only its first year of implementation (Wiley, Gaertner, Spindler, and Subert, 2008). For this study, researchers analyzed the scores on state assessments of nearly 23,000 students representing 866 teachers in math and nearly 18,000 students representing 812 teachers in reading. All of the students were enrolled in grades 3-5 and the study was conducted using data from the 2006-07 school year. The study's findings showed that on both reading and math tests, the students of experienced teachers who elected to opt-in to ProComp voluntarily did slightly better (by a small percentage of one point on the assessments) than the students of veteran teachers who elected to remain in the single salary schedule pay system. Students of opt-in teachers also performed better than students of teachers who were required to join ProComp (all teachers hired since 2006). These findings may at least partially be explained by selection bias, since teachers with a choice of participating may have decided to join ProComp because they were confident they were effective teachers, and thus felt they had a better chance of earning performance bonuses. The evaluators concluded that there is little evidence of a positive effect of ProComp on student achievement thus far (Wiley, Gaertner, Spindler, and Subert, 2008).

A study of school-based bonus plans in Kentucky, North Carolina, and Maryland under which the staff could earn school-wide rather than individual bonuses for meeting school performance goals found that while the school-wide incentives increased teachers' motivation, this did not necessarily translate into higher school performance (Kelley, Heneman, and Milanowski, 2000). However, the authors suspected that unreliability in their measurement instruments may have contributed to the lack of positive effects in their findings.

Knowledge and Skill-Based Pay Plans

Knowledge and skill-based pay plans are designed to provide incentives to teachers to develop their teaching skills and acquire expertise in key areas of importance to their schools or districts (Odden and Kelley, 2002). For example, a district with a growing population of English language learners may reward teachers for obtaining certification in ELL teaching methods. Or, the district may provide additional pay for teachers gaining certification in hard to fill positions such as math, science, or special education.

Most of the studies of knowledge and skill-based plans published to date have focused on implementation and teachers' perceptions. However, studies conducted in the Cincinnati and Washoe Public Schools, and at the Vaughn Next Century Learning Center charter school in Los Angeles, found positive relationships between the extensive standards-based teacher evaluation systems implemented along with these pay plans and increased student achievement (Kimball, White, Milanowski, and Borman, 2004; Milanowki, 2004; Milanowki, Kimball, and Odden, 2005). Although these studies do not address a direct link between the pay systems and student achievement, the assumption is made that the pay systems incentivized teachers to increase their skills in the areas addressed by the evaluations, which in turn led to higher student achievement.

Many knowledge and skills-based teacher compensation plans also reward teachers for becoming nationally certified through the National Board of Professional Teaching Standards process. Studies of the effect of Board certified teachers on student achievement have found that generally, the students of teachers with Board certification scored higher on achievement tests, although the results varied from state to state and by grade and subject area, and the effects were generally small (Goldhaber and Anthony, 2004; Hakel, Anderson Koenig, and Elliott, 2008).

Conclusions

The research suggests that the relationship between resources and student outcomes is mitigated by the effective use of the resources. In other words, the comprehensive and effective use of resources is key to improving low performance or maintaining high performance. While the research suggests that certain resources are important contributors to student success, how resources are implemented is likely to be just as important as what is implemented.

Nonetheless, it is apparent that particular resources are likely to have an effect on student outcomes. It appears that professional development for both administrators and teacher may improve the quality of instruction and consequentially improve student learning. In addition, lower student-to-staff ratios among K-3 teachers, special education teachers, ESL/ELL teachers have been shown to positively influence student outcomes in some studies. The research indicates that lower student-to-staff ratios for library staff, nurses, technology specialists, and counselors may also have positive effects on students. Tutoring and full-day kindergarten are other strategies that have been linked in the literature to improved student outcomes. Recent research indicates that schools and districts that spend more on instruction and find ways to increase instructional time may also be more likely to have high or improved student performance.

Since teachers are often the primary resource implementers, they play a key role in determining student outcomes. The research on teacher qualifications and characteristics is largely inconclusive. There is some evidence that indicates educational attainment, degrees, or certifications improve student performance, while other studies suggest no effect or a negative effect. Teacher experience appears to have the largest impact on performance early in teachers' careers. Studies produce only scant evidence that teacher qualification tests, teachers' verbal ability, and the selectiveness of their educational institution make a noticeable positive difference in student outcomes

Existing research on alternative teacher compensation programs indicate that such programs may offer the potential for increasing teacher motivation and knowledge. This may in turn lead to improvements in student performance. Alternative teacher compensation programs may also contribute to teacher recruitment and retention. At this time however, it is too early to reach any definitive conclusions about how such pay systems may impact student outcomes in the long-term as most programs and associated research are still in their infancy.

It is difficult to make definitive conclusions about the relationship between resources and student achievement. The evidence is mixed and suggests that resources, strategies, and programs must be

implemented effectively to impact student performance. Professional development for teachers and administrators and alternative compensation systems however hold promise for changing practice to improve effective implementation of the available resources.

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IV. Review of Selected Analyses of North Carolina's School Finance System

In the past few years, a number of individuals and organizations have undertaken a variety of analyses that have focused directly and indirectly on North Carolina's school finance system and have either identified the strengths and weaknesses of the entire system, or particular components of the system, and made recommendations about how to improve the system in order to make it more equitable and/or more efficient. Below, we discuss several of these analyses and identify the school finance issues they raised and the solutions they proposed. We selected an eclectic group of authors, ones who focused on different aspects of the finance system and ones who may disagree with each other. We certainly did not find every paper that has been written or every presentation that has been made by the numerous individuals and organizations that have analyzed school finance in North Carolina but we believe the work cited below represents the diverse views held by people who have examined North Carolina's school funding system.

For more than 20 years, the Public School Forum of North Carolina has produced a study that examines both the capacity and effort counties make to support local public schools. In its 2009 report ("2009 Local School Finance Study"), the Public School Forum showed that local support for public schools provided 25 percent of all current operating revenue to school districts, most of which was derived from property taxes. The report noted that property wealth varied across counties, with the ten highest wealth counties having more than seven times the capacity of the ten lowest wealth counties (capacity was defined in terms of equalized property value per student although the report also discussed "ability to pay," which took into consideration both other local revenues available to counties and certain payments counties were mandated to make in support of social services). The report used its figures to show that the difference between the top 10 and bottom 10 wealthiest counties had grown by more than 350 percent between 1997 and 2008.

The Public School Forum believes the wealth "gap" translates into a local revenue disparity, which is demonstrated by a more than four to one ratio in revenue per student between the 10 highest counties and the 10 lowest counties in terms of local revenue generated per student (although such a comparison does not directly show a relationship between wealth and revenue because the basis of ranking the counties changes from wealth to revenue). The 2009 report shows that property tax rates differed across counties, varying around the statewide average of 53.9 cents per $100 of equalized property value from under 20 cents to over 90 cents, with some of the wealthiest communities having lower tax rates than some of the least wealthy communities.

Despite that the report focused on differences in the fiscal capacity and tax effort of counties across North Carolina, which produce variations in local revenue, it notes that the state Supreme Court ruled in 1997 that "the North Carolina Constitution does not require substantially equal funding or educational advantages in all school districts … [c]onsequently, the provisions of the current state system of funding

schools which require or allow counties to help finance their school systems and result in unequal funding among the school districts of the state do not violate constitutional principles" (p. 4).

The John Locke Foundation has issued several "Spotlights" that have focused on education in North Carolina over the past few years. One, in particular, discussed the school finance system ("Equity in School Finance," Spotlight #247, John Locke Foundation, Raleigh, NC, December 23, 2004). The primary focus of the article was on the total per student revenue of school districts. The article challenged conclusions drawn by other organizations, such as the Public School Forum, that there are wide disparities in funding levels across school districts and that such variations are related to the wealth of the districts. The foundation focused its attention on total resources and concluded that the variation in the sum of revenues from state, local, and federal sources was relatively small; it concludes that when other analysts focus on local revenue exclusively, they are examining a revenue source that is both not required, since the state must meet constitutional requirements using its own resources, and, while available, may vary without any state control as permitted by the state Constitution. The foundation suggested that one rationale for local funds is to deal with inter-district price differences, which explain much of the differences in spending across school districts.

Dr. Stephen Jackson has criticized the current school finance system for not providing incentives that would attract highly qualified teachers to high poverty districts, not assuring that state funds get to high need districts, and not providing preschool services for at-risk students ("NC's Problematic Education Finance System," a Powerpoint presentation, Budget and Tax Center, North Carolina Justice Center, April 2010). He suggests modifying the statewide teacher salary schedule to provide specific funding for teachers willing to work in hard-to-staff schools and providing significant salary increases for teachers with 3-12 years of experience while reducing support for higher academic degrees and more than 20 years of experience. He argues that some state allotments are not transparent and may not allocate funds consistent with the purposes for which they were created, producing anomalous results and an inefficient use of funds. Ultimately, he supports a student-weighted approach under which the weights would accurately reflect the added costs of serving students with special needs in districts with uncontrollable cost pressures -- with a requirement that funds allocated for students with special needs be used to provide services to such students, that current limits on numbers of students eligible for added state aid be eliminated, that funds per student increase as the concentration of students in poverty rises, and that small school districts consider merging to improve efficiency.

Janet Hansen *et al*'s case study of the procedures used by the state to fund public education described the various allotments used by the state, noting that "North Carolina relies more heavily than most states on state dollars to support public education," (p. 13) although the study also showed that state support had declined as a portion of all revenue by nearly five percentage points between 1994-95 and 2004-05 with the majority of the decrease being replaced by federal funds (School Finance Systems and Their Responsiveness to Performance Pressures: A Case Study of North Carolina, Janet S. Hansen, Gina S. Ikemoto, Julie A. Marsh, and Heather Barney, School Finance Redesign Project, University of Washington, March 2007).

The study focused considerable attention on the level of state control over school district spending, noting that: (1) although "the school finance system was on paper highly prescriptive, the state had made an effort to increase the ability of school districts to address their particular needs; (2) the number of categorical allotments had decreased in the mid 1990s from 62 to 18 (categorical allotments typically require funding to be spent for specific purposes or in specific ways); (3) in 2004 "only 17 percent of the state education budget was off-limits to fund transfers at the local level" (p. 18); and (4) "the perceptions of local administrators about how flexibly state dollars could be used was often quite different from that of state officials." (p.18) Those local perceptions were based on a sense that: (1) funding came with "unhelpful, unpredictable" strings (state and federal) that constrained the use of funds (including unfunded mandates); (2) a "legacy of centralization that contributed to a culture of 'rule following' rather than innovation," some of which was associated with gubernatorial attempts over the years to improve education performance by requiring that certain programs and services, some very specifically defined, be offered by school districts (p. 42); and (3) the fact that school districts are dependent on county/city elected officials who reviewed budgets and had final say on the availability of local revenues. In addition, the study concluded that both local and state policymakers and administrators felt that the *Leandro* litigation had produced numerous requirements about the kinds of services that needed to be delivered and the ways they should be delivered in order to comply with the state Constitution (pp 50-53).

Another study by the Center on Reinventing Public Education focused on local funding (School Funding's Tragic Flaw, Kevin Carey and Marguerite Rosa, Center on Reinventing Public Education, University of Washington, May 2008). The report notes that "(North Carolina's) funding system was designed to provide enough funds to support the basics. But despite the relatively high percentage of funding coming from the state, differences in local wealth still have a significant impact on funding levels in North Carolina" (p. 7). This is reflected in the fact that "idiosyncracies within the staffing reimbursement formulas tend to favor wealthier, higher spending districts. Those differences are compounded by what each county raises locally for its district" (p. 8). Further, the report indicates that "because the state does not provide local wealth equalization like (some other states so), districts vary dramatically in their capacity to raise local funds" (p. 8).

A presentation by a North Carolina professor Enid Beverly Jones provides another broad overview of the funding system ("Public School Funding in North Carolina," presentation by Enid Beverley Jones at the American Education Finance Association's Annual Conference, April 2003). Professor Jones noted that although total spending per student varied by as much as 2:1 across all districts, local funding varied by a ratio of about 45:1 from the highest to the lowest. She attributed the variation to a combination of disparities in both wealth and tax effort, which may combine in such a way that the wealthiest counties have high tax effort while the least wealthy counties have low tax effort (a different conclusion than one drawn by the Public School Forum).

Two papers by a team of North Carolina professors speak to the school finance system, particularly the structure of statewide salary schedules (Teacher Mobility, School Segregation, and Pay-Based Policies to Level the Playing Field, Clotfelter, Ladd, and Vigdor, Sanford School of Public Policy, Duke University,

May 2010 and How and Why Do Teacher Credentials Matter for Student Achievement (Clotfelter, Ladd, and Vigdor, National Center for Analysis of Longitudinal Data in Education Research, Urban Institute, March 2007). The first paper notes that "teachers, like most people, respond to financial incentives in deciding where to work … evidence shows that teachers are attracted to positions with higher salaries and … they are more inclined to leave their current post … when alternative salaries are higher" (p. 7). It also notes that "research has consistently shown that the most significant educational resource – teacher quality – is distributed unevenly among schools" (p. 33). While the authors state that "… analysis indicates that salary differentials do have some role to play in easing the challenge that hard-to-staff schools face in attracting teachers with strong qualifications" (p. 33) they also conclude that "for teachers with strong pre-service qualifications in their initial teaching spells, the simulated salary differentials required to neutralize the effect of large concentrations of disadvantaged students are large, and on the order of 40 to 50 percent of salary (and) …estimates for teachers in subsequent (teaching) spells imply that no salary differentials would be large enough to compensate them for being in schools with concentrations of disadvantaged students" (p. 34).

The second (but earlier) paper spoke more directly to the structure of the salary schedule by noting that:

> "…close to half the achievement returns to experience arise during the first few years of teaching but returns continue to rise throughout most of the experience range. Furthermore, it appears that all of the returns are attributable to experience *per se* rather than to differential rates of attrition between more or less effective teachers. In addition … (North Carolina's) licensure tests provide policy relevant information, especially with respect to the teaching of math; …the form of licensure matters; …the National Board Certification process appears to identify effective teachers but does not make them more effective; and … masters degrees obtained after 5 years of teaching are associated with negative effects on student achievement." (p. 38)

Vigdor also prepared a paper for the Urban Institute (Teacher Salary Bonuses in North Carolina, Jacob L. Vigdor, National Center for Analysis of Longitudinal Data in Education Research, Urban Institute, February 2008) that examined the impact of bonuses that had been provided to teachers in North Carolina for several years. He reported that the bonuses were widely supported but that their value may have been undermined by their being based on school performance, rather than the performance of individual teachers; Vigdor suggested that such an approach led teachers to move from low performing to high performing schools despite the program's focus on change in student performance rather than absolute performance.

In summary, discussions of North Carolina school finance have focused on a variety of issues although the one that has received the most attention is the role of local support. Such local support has been viewed as varying widely among school districts, leading to a variation in the number of personnel and, perhaps, the characteristics of personnel employed by school districts. This view exists despite the fact that local funding represents a relatively small share of all revenue and that its existence does not present a constitutional problem.

V. Summary of Interviews

This report's analysis of North Carolina's school finance system included interviews APA conducted with a number of individuals that have education policy and finance expertise. The purpose of these interviews was to better understand both how the different state allotments operated as well as to understand people's views of the strengths and weaknesses of those allotment structures. Those interviewed were selected on the basis of recommendations made by the state, some of whom had been identified in the Request for Proposals which precipitated this work. While a protocol was developed to guide each interview (See Appendix A), many discussions covered topics about which interviewees had specific knowledge and/or special interest. Two APA staff participated in most interviews in order to assure that the discussions were focused and documented. To increase the probability of obtaining honest and clear answers to questions, those interviewed were told that none of the information obtained in the discussions would be attributed to any individual. While most interviews were conducted in person in Raleigh, in some cases interviews were conducted by phone so as to assure input could be gathered from those who lived far from Raleigh or who were unavailable at the time the interviews were conducted. The following people participated in the interviews:

- Representative Joe Hackney, Speaker of the House
- Dr. William Harrison, State Board Chairman
- Philip Price and Department of Instruction staff
- Dr. Larry Price, NCASA President with Executive Director Bill McNeal and Assistant Executive Director Katherine Joyce
- Wendell Hall, President of the School Boards Association
- Sheri Strickland, NCEA Executive Director, and associates
- Chief Finance Officers from various school districts: Mike Griffin, Moore County; Pam Satterfield, Richmond; Kerry Shannon, Henderson County; Norris Barger, Transylvania County; Kathy Isenhour, Hickory City; Ricky Lopes, Cumberland; Hank Hurd, Durham (currently Interim Superintendent); Mark Winters, Wake County; Jeff Hollamon, Onslow; and Kerry Crutchfield, Winston-Salem.
- John Dornan, Public School Forum
- Steve Jackson and associate, Budget and Tax Center/NC Justice League
- Robert Spearman (Partner at Parker Poe) and Gerry Hancock (Low Wealth School Consortium)
- Matt Harrell, lawyer for NC City Schools and Rural Schools

- Dr. Helen Ladd, Sanford School of Public Policy at Duke University.

Since interviews were undertaken to obtain as wide a set of opinions as possible, and were not used as the basis for a specific set of recommendations, what is reported below is a summary of the major themes we heard from the people we interviewed. Though this summary does not reflect a consensus view across all, or even a majority of, interviewees, these themes also do not reflect the views of only a single participant.

What was learned from the interviews helped guide APA in developing its data analysis plan. For example, people expressed a variety of views about the equity of using position allotments; while most people strongly supported the use of position allotments, some were concerned that while they assured that districts could employ the best qualified teachers in terms of education level and experience, some districts were able to employ teachers with "stronger" characteristics simply because such teachers were more attracted to those districts. Therefore, our review of school finance equity went beyond looking at variations in allotted revenues and examined variations in numbers of teachers and their characteristics.

While the interviews covered a wide range of issues, the responses can be organized around a few specific topics, as outlined below:

- Review of Existing State Allotments
    - Position Allotments
    - Dollar Allotments
    - Special Purpose Allotments
    - Transportation
    - Capital
    - The flexibility of allotments
- The Role of State Allotments in School Finance Equity
- The Effectiveness of the Allotment Procedure

Allotments

Previously, this report has described the allotment system used by North Carolina to allocate the majority of its support for public schools. While there are a variety of ways to organize a discussion about allotments, we focused our attention primarily on three types of allotments:

1. Position allotments, which support a specified number of people at particular salaries based on statewide salary schedules;
2. Dollar allotments, which allocate specific dollar amounts for each student using a variety of different student counts; and
3. Special purpose allotments, which have defined objectives and typically use formulaic allocation procedures.

Below, is described what interviewees had to say about each of these different types of allotments.

Position Allotments

The teacher allotment system was widely supported. Those interviewed generally expressed two key reasons for this support: (1) it assures that a basic number of teachers are available in all school districts; and (2) it guarantees that teachers all around the state receive a reasonable salary.

While the teacher allotment system was generally supported, interviewees did discuss a number of potential adjustments to consider. These ranged from modifications in the structure of the statewide salary schedules to using average salary levels rather than individual teacher characteristics to determine the amounts districts should receive.

Many respondents mentioned that the current system is based on attributes of teachers – education level and experience – which are not the only factors that should be used to attract and retain well-qualified personnel. Those interviewed suggested that the statewide salary schedule should be modified to include additional factors, such as: (1) working in a hard-to-staff school); (2) developing and fulfilling a rigorous, individualized professional development plan; and (3) measuring teacher accomplishment based on evaluation and/or student performance.

There was also discussion of the possibility of basing state allocations on average teacher salary levels, for districts or the state as a whole, in order to promote neutrality in the teacher labor market. Some people suggested that it would make sense to recognize both the fact that some regions of the state have a higher cost of living than other regions and that some regions of the state find it difficult to attract highly qualified teachers (although no one interviewed thought that these factors should be addressed individually).

Dollar Allotments

Several issues were raised by those interviewed concerning dollar allotments. First, there was concern about the high level of support for teacher aides. Some interviewees expressed the view that research did not support the use of teacher aides to improve student achievement and they suggested that it would be more effective to reduce support for aides and use it instead to provide more certificated personnel or to provide other kinds of support for certificated staff including professional development and mentor teachers.

Second, there was concern about caps being placed on the number of students used as the basis of allocating state support for special education or limited-English proficiency (LEP) – there is no limit on the number of students for which revenue received from the state can be spent. Those interviewed noted that there is a significant variation across districts in the proportions of these students that they serve (for reasons well beyond the control of districts), and that it was inappropriate to set a cap that fell below the proportion of actual students that some districts served. This concern was not raised in the case of gifted students given that districts use multiple ways to identify gifted students.

Third, the use of a flat rate for eligible students, particularly those in special education programs, was thought to be inappropriate in several ways. Since districts vary in the proportions of students they serve who have comparatively high, moderate, or low needs, some differentiation based on special education student need was widely supported. The use of a flat rate was viewed as over-compensating certain districts and under-compensating others relative to their actual needs.

Special Purpose Allotments

In general, special purpose allotments, such as those for low wealth counties or for disadvantaged students (the Disadvantaged Student Supplemental Fund, DSSF) were viewed as overly complex. Most interviewees did not understand how the allotments worked and wondered whether they were accomplishing the purposes for which they were created. While no one suggested that the state should not provide support to low wealth counties or for at-risk students, interviewees expressed the hope that the procedures used to allocate funds for those purposes could be simpler and more direct, calculated on the basis of information that changes annually, and designed to promote greater equity in terms of local needs, local wealth, and local tax effort.

As far as DSSF is concerned, the allotment was appreciated by the districts. However, districts expressed two concerns: (1) multiple approaches are used to count "disadvantaged" students, none of which are based on student performance; and (2) one measure changes infrequently since it is based on Census data. Some interviewees also hoped that all funds for disadvantaged students could be combined and allotted through a single, easy to understand procedure, which might alleviate the distrust some people felt was generated by complex procedures.

A number of interviewees discussed the allotment for low wealth counties, which they felt was unnecessarily complicated. Even those who support the concept of providing support to low wealth communities found it difficult to be sure that the funds were being distributed as intended, particularly given the multiple bases used to distribute the aid. Some people did not understand why it was necessary to use multiple measures of wealth (property and income), why Census-based data were used (since they did not change as frequently as district circumstances changed), or why the population density of districts played a role in calculating support. Some felt that there should be direct ties between state aid and the tax effort made by the counties to support education, in part to create an incentive for counties to provide such support. In fact, some people expressed an interest in requiring counties to provide some support for education, which they felt was justified by language in the North Carolina Constitution. Interviewees who felt comfortable talking about the low wealth county allotment believed that the use of a more straightforward approach, considering both *district* wealth and tax effort for education (as opposed to *county* wealth and county total tax effort for government functions beyond education), would go a long way toward improving the overall equity of revenues across the school districts of the state.

Finally, some people discussed the allotment of supplemental funding for small counties, which, like other special purposes allotments was felt to be overly complex. As with other allotments, interviewees expressed suspicion that the small county allocation procedure was not actually accomplishing its

objective. However, participants did not have specific recommendations about how to change the allotment beyond focusing it very narrowly on a well-defined objective.

Transportation

The transportation funding system is viewed as confusing by most of the interviewees. Many questioned if the system measures those factors that actually affect the expenditures districts incur in providing transportation to students. There was also a sense that the existing emphasis on efficiency failed to take into account certain uncontrollable situations districts face. In particular, interviewees noted that current aid is based on calculations made some time ago, before districts were required to provide certain services – such as those required to transport students in magnet schools – that are now provided. Many interviewees expressed the view that state support should be based on the actual expenditures of school districts under the assumption that districts have no reason to operate inefficient transportation systems (this raises an question about the nature of "efficiency" since decisions about how to provide transportation might reflect operational decisions, such as stopping at each student's residence, that might be considered to be costly).

Capital

The interviewees consistently expressed that there is significant need for capital funding across the state. It is feared that the current system of allocating state dollars from the Lottery and Corporate Income Taxes to support capital needs gives a false impression to the public that the problems are being taken care of, when in fact, such revenue falls far short of what is needed at the district level. Equity issues also arise since districts depend on their counties to help fund capital projects and not all counties and districts have the same working relationship or ability to pay. Overall, most respondents felt the issue of capital funding needs to be further addressed, particularly for low wealth and high growth districts.

Flexibility

Interviewees frequently mentioned that flexibility is of great interest to most school districts and that there are some efficiencies to be reached with a certain amount of flexibility. Almost all understood that the state had provided greater flexibility in the use of funds in the last few years. Some expressed concern, however, that such flexibility was provided while also reducing the overall level of funding made available. They indicated that there comes a point at which efficiency resulting from flexibility maxes out, unless the structure of the services offered is changed.

A few interviewees mentioned the possibility of combining some allotments, particularly dollar-based allotments, to increase flexibility and reduce the likelihood that administrators would simply comply with the rationales used in distributing separate allotments. For example, one common perception is that some districts spend the money they receive from each particular dollar allotment exactly as it is distributed (e.g., an amount per student for books is spent only on books), even though districts have some flexibility in their spending behavior. Combining many such allotments might strengthen the concept of flexibility, particularly if less direction were provided in defining the basis of the allotment. Several of those interviewed wondered whether it would make sense to distinguish funding flexibility

among school districts based, for example, on student performance. For instance, the state could provide a greater level of flexibility to higher performing districts, or to those with fewer audit-related problems, while providing less flexibility to districts performing at a lower level or that have more audit-related problems.

Equity

Generally interviewees agreed that the current way that North Carolina allocates its support provides a firm basis for a highly equitable system. People recognize that overall revenue equity is facilitated by the fact that a high proportion of all revenue comes from the state. People also recognize that local support plays an important role and that such support varies across counties, interfering with the level of equity that can be achieved.

None of those interviewed, however, supported the idea of capping the amount of dollars that local districts can generate. Instead interviewees suggested that a better way to promote greater fiscal equity might be to rethink the way the state provides supplemental revenue to low wealth counties – using an approach that would provide more support, be more sensitive to wealth differences across counties, and, perhaps, be more sensitive to local property tax effort. Interviewees also suggested exploring the possibility of requiring counties to make a minimum level of local tax effort.

Other kinds of equity concerns were expressed by interviewees, including ones related to numbers of personnel, personnel characteristics, and the availability of specific programs and services such as professional development, early childhood education, the availability of teacher mentors, and services for students with special needs.

Finally, as mentioned above, there was great concern expressed about capital funding, which is currently heavily dependent on local revenue and therefore reflects to a great degree the wealth disparity among districts and the willingness of voters and local leaders to approve capital projects.

Effectiveness

Interviewees raised two issues regarding the distribution of state support that impacts how effective school districts can be. First, they discussed the amount of flexibility that school administrators have in determining how to use the state aid they receive. While many agreed that flexibility had been increasing over time – in part rising as state aid decreased – greater flexibility was still desired. It was viewed by many that added flexibility would promote the allocation of resources in ways that are more consistent with underlying philosophies about service delivery – from how many people are employed to the kinds of supplies and materials that support those people. Some questions were raised about whether each district has access to effective district leaders and business officials that would guide each district in its quest toward efficiency and effectiveness.

Second, interviewees believe that a highly effective use of resources is to provide professional development. They see resources that had been used for that purpose as being reduced in recent years at the same time that resources for teacher aides (considered by some to be an ineffective use of resources) continue to be provided.

VI. The Equity of North Carolina's School Finance System

The purpose of this section is to describe the procedure APA used to evaluate the equity of the school finance system in North Carolina. Understanding the level of equity a state school finance system achieves is important to policymakers for several reasons: (1) over the last half century, equity has come to be viewed as a major goal of state school finance systems; (2) equity is one factor that state courts use to determine whether a system is fulfilling state constitutional requirements; and (3) understanding how equitable a school finance system is can provide useful information about how to modify the structure of the system.

Our experience is that people use the word "equity" very loosely, often justifying a change in a school finance system as being good or bad because it would raise or lower equity without defining what equity means or measuring the extent to which the level of equity would actually change. For some people, equity exists when the value of a particular school finance variable, such as per student expenditures, is the same across all school districts. For others, equity recognizes differences across school districts, sometimes based on justifiable reasons such as student need. Imprecision in the use of the word "equity" arises because, in fact, it has no simple definition that is accepted by policymakers, the academic community, or the courts; as a consequence, there is no single measure of equity that is used to evaluate how equitable a school finance system is.

Regardless, it is important to develop a framework for thinking about the concept of equity. Once a framework has been developed, it is possible to use some relatively simple statistics to measure how well a school finance system is performing in terms of the equity it achieves.

Defining School Finance Equity

As mentioned above, those who talk about school finance equity focus at least some attention on the variation there is among all school districts in the state. These differences arise in three broad types of financial characteristics, including: (1) revenue from different sources (expressed in per student terms); (2) the resources obtained by spending revenues (sometimes expressed in per student terms but sometimes expressed in other ways when focused on personnel and personnel salaries; and (3) the tax effort used to generate whatever local support is provided. Revenues and resources deal with equity for students while tax rates deal with equity for taxpayers (people generally agree that school finance equity affects those two groups).

People who are concerned about variation among school districts typically point to differences in per student revenues, the numbers of employees available or their salaries, and the level of local property tax rates as indicators of inequity; for example, they might pay attention to differences between the highest and lowest levels of these factors across all districts, and how such differences may have changed over time, as indicators of disparity among all districts and, therefore, of inequity. In our view, this approach (or any approach that uses information for only a few school districts – such as those with

the highest and lowest values of some variable) is overly simplistic because, among other things, it excludes information about most school districts.

The problem with simply focusing on variation is that the characteristics of school districts vary among themselves, in some cases dramatically, and such differences may be responsible for differences in revenues, resources, or tax effort. For example, one district may serve a larger proportion of students whose need for programs and services are relatively high, which may translate into appropriately higher spending. Or a district may face cost pressures that are beyond its control, such as those that are related to enrollment level (small districts are known to have higher per student costs than moderate size districts) or regional cost differences (which are generally accepted to exist in most states). Too, school districts vary dramatically in wealth, no matter how it is measured, which results in large differences in both how much local revenue districts provide and in the tax effort they make to generate local revenue.

Over the last century, most states have made a considerable effort to differentiate the amount of state aid that is allocated to different districts so that state support is sensitive both to the cost pressures districts face and to district wealth. Even though states initially provided aid to school districts on an essentially equal basis (100-150 years ago, providing money to support a specified number of teachers with certain qualifications for a given period of time or to purchase a specific number of textbooks), over the last 25-100 years they have modified that approach so that needier districts receive more support. Today it would be considered to be inequitable for states to provide the same amount of aid to every district, particularly if the amount provided is known to be insufficient by itself to provide a reasonable level of support (that is, state aid is designed to vary across districts when all districts are expected to supplement state aid in order to assure that a reasonable level of programs and services are available).

In a similar sense, resources and total revenue from major sources (state aid, local taxes, and federal support) can be expected to vary across school districts due to the uncontrollable cost pressures districts face that are associated either with student characteristics, such as the proportion of students enrolled in high cost special education programs, or district characteristics, such as size or regional costs. Of course, other factors might explain higher spending or greater resource levels in some districts as compared to others, including district wealth or tax effort. In any event, the relationships between revenue, wealth, and tax effort are not obvious – wealthier districts might have a “taste” for higher spending or their taxpayers might be willing to bear a higher tax burden or wealthier districts might be able to have lower tax rates and still generate the revenue they want while lower wealth districts are required to have much higher tax rates to produce needed revenue.

In thinking about school finance equity, it is important to distinguish between “appropriate” and “inappropriate” spending and resource factors, which can be determined on the basis of both public policy and litigation. For example, while state aid might be expected to be inversely related to district wealth (wealthier districts should receive less support than their less wealthy peers), per student revenues or resources are expected to be neutral with regard to wealth (courts have generally found that since school districts are created by the state and a state is equally responsible to all students, a

strong relationship between district wealth and resources is problematic, particularly when state support is a small portion of all revenue – although courts have generally supported the concept that districts may supplement state support and have required some local support regardless of district wealth).

As a result of considerations such as those described above, a framework for thinking about school finance equity is based on the idea that equity means equality across school districts unless uncontrollable conditions exist across districts that impact their revenue needs and expenditure patterns. These uncontrollable conditions include cost pressures caused by both student and district characteristics and, in the specific case of state aid, district wealth.

Using this framework, in order to evaluate equity it is necessary to examine both: (1) the extent of the variation in these variables that represent sources of revenues or expenditure functions and (2) the extent of the association between those variables and those factors that cause uncontrollable cost pressure on school districts. A school finance system that produces a lot of variation in a variable, such as per student revenues, can be considered to be equitable provided that the associations between that variable and measureable cost pressures is high. At the same time, a system that produces little variation in a variable such as per student revenue, while large variations in cost pressures exist can be viewed as being inequitable. A last component of a framework is to examine how variation in variables and association between pairs of variables change over time; this information can be used to identify the extent to which equity is strengthening or weakening and to pinpoint which components of the school finance system should receive attention.

Because there are numerous school finance variables of interest in terms of equity (for example, revenues, resources, and tax effort) it is not possible to express equity as a single number; that is, no single scale (say of numbers from 1-100) can be used to express the level of equity a school finance system achieves.

Measuring School Finance Equity

In order to assess school finance equity, it is necessary to measure two things: (1) the extent of variation in a school finance variable, such as per student revenue, across all school districts and (2) the extent of the relationship between two school finance variables, such as per student revenue and district need, across all school districts. A variety of statistics exist that can be used to measure the variation in one variable across a set of cases (all of the school districts in a state) and the strength of the relationship between two variables across a set of cases. Our experience is that the best statistic to use for the purpose of measuring variation in a variable is the coefficient of variation and that the best statistic to use for the purpose of measuring the relationship between two variables is the correlation coefficient.

The coefficient of variation is simply the standard deviation of a set of values for a group of cases (for our purposes, all of the school districts in North Carolina). We express the coefficient of variation as a three digit number that has a minimum of zero (.000) and no maximum – *values below .100 are considered to be low, values between .100 and .400 are considered to be moderate, and values above*

.400 are considered to be high (although our experience is that these ranges vary somewhat by the specific variable being examined). For example, if we were looking at spending per student and we had five school districts with values of $5,000, $5,200, $5,400, $5,900 and $6,600, then the standard deviation would be $641.9, the average would be $5,620, and the coefficient of variation would be .114 It should be noted that each case has the same weight in determining these figures so that, if these were school districts, the calculation is not modified to take into consideration the enrollment of each district – while one district might have 1,000 students, another has 5,000 students, and another has 50,000 students, those differences would not affect the figure. This makes sense since our focus is on school districts, each one of which is equally important). Changing the values of the cases can change the magnitude of the coefficient of variation. If the highest value ($6,600) had been $6,100, then the coefficient of variation would have been .084; if the value of the highest case had been $7,200, then the coefficient of variation would have been .154.

One way to interpret the coefficient of variation is that about two thirds of all cases will have values within a range of one standard deviation (the coefficient of variation times the average) above and below the average. In the case of the original per student expenditure values, this means that about two thirds of the five districts would have values between about $4,980 and $6,260 ($5,620-$640 and $5,620+$640). As the coefficient of variation rises, the range of values in which most cases will be found grows (when the coefficient of variation dropped to .084, the range dropped to plus/minus $470 around the average while when the coefficient of variation rose to .154, the range increased to plus/minus $880 around the average).

We use the coefficient of variation for several reasons. First, unlike some other measures of disparity (such as the range, the difference between the highest and lowest values or the federal range ratio, the same as the range except that 2.5 percent of cases are excluded at the high and low ends) it includes the values of all school districts. Second, it does not set pre-ordained objectives for a variation (some school finance equity measures assume that an objective is for districts to be average). Third, the coefficient of variation is not affected by inflation – if the values for all school districts rise by the same percentage, the coefficient of variation does not change, making it useful in comparing how disparity has changed over time. Finally, the coefficient of variation is relatively easy to calculate and to interpret.

The correlation coefficient is a number expressed in hundredths between zero (.00) and one (1.00), which can be positive or negative. The correlation coefficient measures the strength of the relationship between two variables (two sets of values for a set of cases, which are school districts) and indicates whether, as one variable increases, the other variable also increases, decreases, or is unrelated (based on the fact that *figures below .30 are considered to be weak, figures between .30 and .70 are considered to be moderate, and figures greater than .70 are considered to be strong*). One way to interpret the correlation coefficient is to multiply it by itself – the resulting figure is sometimes viewed as the proportion of the variation in one variable that is explained by the other variable (although this should not be over-interpreted as a cause and an effect); for example if the correlation between two variables is .60, then one variable might be viewed as explaining 36 percent (.60 times .60) of the variation in the other variable. It should be noted that if the purpose of examining a set of variables were to explain the

behavior of one of them, then a more advanced statistical technique, such as multiple regression, should be used.

We use the correlation coefficient for several reasons. First, it includes the values of all school districts. Second, it is unaffected by equal changes (additive or multiplicative) over time in one or both variables, making it useful in examining how relationships between variables have changed over time. Third, it is easier to calculate and to interpret. We do not show correlation coefficients for per student revenues for which the coefficient of variation is less than .100 (that is, a low level of disparity) because it is possible that the correlations could be misleading.

North Carolina's Special Situation

North Carolina represents a special situation in terms of this framework because, unlike most states at this time, the primary purpose of its public school aid is to assure that it can provide a reasonable amount of resources so that all school districts can offer a basic level of services without a need for any supplemental funding from local or federal sources (in other states, either local funding would be expected to assure a reasonable level of resources or the question of reasonableness would not be an issue). While the vast majority of the state's allotments are designed to provide that reasonable level of support (as described in an earlier section of this report), a number of allotments have been created to deal with both the cost pressures school districts face, based on: 1) the characteristics of students, such as the presence of students with special, high cost needs; 2) the characteristics of districts (or counties), such as size, as mentioned above; and 3) the wealth of school districts (based on the wealth of counties). Therefore, we would expect that state aid, by itself, should be highly equitable – that is it should not vary too widely among districts and the extent to which it does vary should be moderately and directly related to district needs and only modestly and inversely related to district wealth.

Experience would suggest that local support could vary to a large extent across school districts and that it would be strongly and positively associated with district wealth and needs. This means that tax effort could vary across districts, which in other states might be interpreted as an inequity for taxpayers; in North Carolina, a variation in local tax effort would not be of interest – since the court has declared that local revenue has no legal bearing – unless the court were to find that state aid, in and of itself, was insufficient to meet constitutional objectives and that local funds were needed to assure that basic education services could be provided in all school districts. Finally, adding federal revenue – which is targeted to help schools serve students with special needs – into the mix should increase the variation across districts in the combined total of state, local, and federal revenue per student, strengthen the association between such revenue and district needs, and mitigate the relationship between such revenues and wealth.

School Finance Equity in North Carolina

Having discussed a framework for thinking about equity and identified a couple of statistics that can be used to measure aspects of that framework (the coefficient of variation and correlation coefficient), we can analyze the extent of school finance equity in North Carolina. Before getting started, we should

note that all per student figures are based on state-determined ADM (average daily membership) figures, which is a particular way of counting students based on the students who are enrolled to attend school on particular days during the year.

Major Sources of Revenues: Disparities

We start the analysis of equity by focusing on the major sources of revenue (state, local, and federal) to school districts in North Carolina. We examine two years of data, 2003-04 and 2008-09, in order to determine how reliance on major sources of revenues has changed over time. Information about the variation in major sources of revenue is shown in Table VI-1 (tables are shown at the end of this chapter). As indicated, in 2008-09, on average (the average of the figures for the state's 115 school districts, which is not the same as the accounting average) the state provided $5,273 per student while local sources (most of which was based on property taxes provided $1,253 per student, and federal sources provided $877 per student. This resulted in combined totals of $6,526 per student for state and local sources and $7,199 for state, local, and federal sources (it is worth noting that the average totals for combined sources do not match the sum of the averages for each source included in a combination because these figures are not accounting figures – they reflect the averages of 115 figures without regard to student enrollment in each district). The tables indicate that state support represented the largest major source of support in both 2003-04 and 2008-09 but because local support rose at a faster rate than state support between 2003-04 and 2008-09, the state share declined over the five year period while local support increased (as did federal support).

The tables also indicate the minimum and maximum levels of per student support for each of the major sources in 2003-04 and 2008-09. In 2008-09, state support ranged from $4,088 to $11,576 per student (a ratio of 2.83 to 1.00) and while the minimum had grown by 12.0 percent between 2003-04 and 2008-09, the maximum rose by 37.8 percent. At the same time, the minimum and maximum amounts of local support were $131 per student and 4,499 per student in 2008-09 (producing a ratio of 34.34 to 1.00) and the minimum and maximum amounts of federal support were $380 per student and $2,436 per student (ratio of 6.41 to 1.00). Combined, the minimum amount of state, local, and federal revenue was $5,382 per student and the maximum was $14,593 per student in 2008-09 (resulting in a ratio of highest to lowest of 2.71). It is worth noting that the difference between the minimum and maximum amounts of support were nearly $7,500 for state aid, $4,400 for local support, $2,100 for federal support and $9,200 for all three sources combined.

The coefficient of variation for state revenues was moderate in 2008-09 (at .204) and it grew 28.3 percent between 2003-04 and 2008-09. As mentioned above, one way to interpret the coefficient of variation is that two thirds of all districts (or about 77 districts) had levels of state aid that varied from about $4,200 to about $6,350 (about a 50 percent difference). Another way to illustrate the extent of the variation is to rank all districts by the amount of state aid per student they received, divide them into a number of groups, and display the averages for each group; we divided the districts into four groups (three groups of 29 districts and one group of 28 districts), which are referred to as quartiles. Looking at the 2008-09 quartile averages in Table VI-1, the quartile averages rise from $4,403 in the

lowest quartile to $4,798, to $5,268, to $6,624 in the highest quartile. From all of this information, we conclude that there is a moderate level of variation in the state aid per student received by school districts in North Carolina; what we will examine below are possible causes for that disparity.

Local support per student varied to a far greater extent than state support per student. In 2008-09, while the average amount of local support was $1,253 per student, the minimum level of local support was $131 per student and the maximum level was $4,499 per student. The coefficient of variation for local support was .575 in 2008-09, a level slightly higher than it had been in2003-04. Quartile averages for local support per student rose from $556, to $982, to $1,292, to $2,181; one way to illustrate the larger variation in local support as compared to state aid is to divide the value of the highest quartile by the value of the lowest quartile – for local support that ratio was 3.9 while for state support the ratio was 1.5 in 2008-09.

Federal support also varied across school districts in North Carolina, producing a coefficient of variation of .356 in 2008-09, a figure between the ones for state support and local support and one that decreased between 2003-04 and 2008-09. The ratio of the highest quartile to the lowest quartile was 2.5 in 2008-09 (it had been 2.8 in 2003-04).

Combining state and local revenue together actually reduces the variation in per student revenue to a level slightly below that of state aid alone (in 2008-09, the coefficient of variation for the combination was .174, slightly below the level of .204 for state aid alone). Two reasons explain this: (1) local support is low compared to state support (in 2008-09 average local support was only 24 percent of average state support) and (2) local support tends to have been slightly higher in districts with lower state support (as indicated by the fact that the correlation between the two sources of support was -.25). The ratio of the highest to the lowest quartile of state and local support was 1.4 in 2008-09, just below the ratio of 1.5 for state aid alone).

Combining federal support with state and local support does not change the level of variation in per student aid (the ratio of per student support of the highest quartile to that of the lowest quartile was 1.4 in 2008-09, the same as for state and local support). In fact, federal revenue per student was positively correlated with state aid per student while it was negatively correlated with local revenue per student. Given its relative magnitude and those relationships, federal support appears to have little impact on the disparity in per student revenue across all school districts.

Major Sources of Revenue: Relationships

In order to better understand why disparity exists in the major sources of revenue to North Carolina's school districts, we focused our attention on six factors that are either logical based on our experience (that is, it would make sense if they did explain why some districts received more revenue than others) and/or are generally recognized as explaining such variations in other states. The six factors we looked at were:

1. District enrollment (size);

2. The relative need of school districts for revenues based on the comparative cost of serving students in special education, those coming from low income families, and those with English language difficulty (need)[7];
3. The wealth of school districts, defined as equalized assessed property value per student (wealth)[8] ;
4. The tax effort school districts made to support current operations (property tax effort)[9];
5. Relative differences in the prices counties face in hiring and retaining teachers, which is based on an index APA created that is described in another section of this report (geographic cost); and
6. Relative differences in the attractiveness of counties to teachers, which is based on an index APA created that is also described in another section of this report (teacher attractiveness).

In some cases, support from one of the three major revenue sources, or from one component of a particular major source, might be specifically designed to vary based on these factors (for example, the state may have decided to allocate more support to small school districts than to large ones or local districts might decide that they need more revenue because their geographic costs are higher). In other cases, the relationship between per student support and a factor might be random, not reflecting the intentional behavior of state, local, or federal government.

The figures in Table VI-2 show correlation coefficients between each of the major sources of school district revenue and the six factors; in the cases of three factors, the table also displays quartile averages in order to illustrate the correlation (unlike the quartile figures shown in Table VI-1, in Table VI-2 districts are ranked based on a particular factor and the average level of per student revenue is shown for groups of districts that have relatively high or low levels of that factor). For example, in 2008-09, the correlation between state revenue per student and size was -.36, indicating that the larger the school, the lower the amount of state revenue per student (a relationship that was slightly weaker than it had been in 2003-04). The extent of the relationship is shown in the quartile averages, which indicate that the smallest quartile of districts received $6,397 in state support per student, on average, while the largest districts received $4,562 in state aid per student (the ratio of the smallest to largest districts was 1.4 although the level of state aid dropped more in moving from the smallest quartile to the second smallest quartile, $1,163 per student, than it did in moving from the second largest quartile to the largest districts, $326 per student – indicating that the relationship between district size and state aid

[7] Comparative cost is based on APA's experience in estimating such costs in numerous other states and reflects excess cost weights (above those of serving students without special needs) of 1.10 for special education, .40 for students from low income families, and .90 for students with limited-English capability.

[8] APA created a wealth figure for all 115 school districts.

[9] APA imputed property tax effort by dividing local support by property wealth, which assumes that all local revenue comes from property taxes (which is not the case) so that districts can be easily compared to one another.

per student was curved rather than a straight line). Given that per student costs are typically higher in small districts than in large ones and that the relationship between district size and cost is curvilinear, the fact that state aid varies indirectly with size makes sense (of course, some state aid is distributed with county size in mind).

State aid per student was also positively associated with need (based on a correlation of .26 in 2008-09, which was somewhat lower than had been the case in 2003-04 when it was .42). The quartile information shows that as district need increased, state aid rose consistently across the quartiles although the differences between quartile averages were small and the ratio of state aid per student in the highest quartile of districts to that of the lowest quartile was 1.18 (which was somewhat higher than the ratio of relative need in the highest need quartile to the relative need in the lowest need quartile, 1.11). Again, since a number of state allotments are designed to allocate more aid to districts with higher needs of one sort or another, the fact that state aid varies in direct relationship with district need is appropriate.

State aid is basically unrelated to district wealth, based on a correlation of .07 in 2008-09. The quartile information suggests that the relationship between state aid per student and wealth is "U-shaped" with both the lowest wealth and highest wealth quartiles having similar average aid levels, both of which were higher than aid levels in the middle wealth quartiles. As was mentioned above, while in most states revenue from the state is designed to be inversely related to wealth (that is there should be a strong negative correlation between wealth and aid) that is not the case in North Carolina, where it would be expected that state aid should be neutral with regard to wealth (in fact, only a very small amount of state aid is designed to go to low wealth counties, which might be expected to produce a small negative correlation). At the same time that state aid is essentially neutral with regard to district wealth, it is somewhat negatively associated with district tax effort – districts with higher tax effort tend to receive more state aid.

The strongest correlations between the explanatory factors and state aid indicate that more state support per student is allocated to districts with lower costs and to districts that are less attractive to teachers despite the fact that neither factor is specifically included in the way state aid is calculated. Logically, it makes sense for the state to provide more revenue to districts with higher costs; at the same time, it may make sense to provide less revenue to districts that are attractive to teachers.
Not surprisingly, local support is correlated with both wealth and tax effort; the wealth quartiles indicate that local support increases as wealth rises and that districts in the highest wealth quartile raised about twice as much revenue per student as districts in the least wealthy quartile. However, local support is unrelated to need. Local effort is positively associated with size but, as the quartiles indicate, only in the sense that the smallest districts raise less local revenue as compared to all other districts. Districts that have higher costs generate more local revenue and districts that are more attractive have more local revenue.

Federal revenue is primarily driven by district need (and inversely related to district attractiveness). Very small districts with the highest needs and the least wealth receive higher levels of state aid than other districts.

Overall, the combination of state and local revenue results in most districts receiving similar amounts of revenue with somewhat higher levels of revenue going to the smallest, wealthiest districts (and to a smaller extent, to the neediest districts). The addition of federal revenue does not change that result to any extent.

Relationships Between Explanatory Variables

Given that we have spent some time discussing a set of six factors that might explain the variations that exist in major revenue sources to North Carolina school districts, it makes sense to independently examine those factors and how they are related to one another. The figures in Table VI-3 indicate the simple average (the average of 115 district figures unaffected by the enrollment level of each district), the coefficient of variation, the average for each quartile, and the number of students in each quartile (there are always about 29 districts in each quartile) for 2003-04 and 2008-09. For example, for district size, the average was 12,265 in 2008-09 and the coefficient of variation was 1.619, which indicates a wide disparity in district size; this is supported by the quartile averages, which show that the smallest 29 districts had an average enrollment of 1,962 students (and enrolled only four percent of all students) while the largest 29 districts had an average enrollment of 33,449 (and enrolled almost 69 percent of all students) – over time, the average size of school districts has grown and the variation in size has increased (the coefficient of variation rose by 10 percent) and while the smallest districts have seen a reduction in enrollment, the largest districts have seen a rise in enrollment.

Looking at wealth (property value per student), it is clear that there was substantial variation in the wealth of school districts in 2008-09, that both average wealth and the disparity in wealth had grown over time (average wealth increased by 39 percent while the disparity in wealth rose by 44 percent), and that the increase over time in wealth was greatest in districts that had been wealthy in 2003-04(the average wealth of the wealthiest quartile grew by about 58 percent while the average wealth of the least wealthy quartile rose by about 23 percent).

On average, district need was 1.30 in 2008-09 (that is, the cost of serving all students, including those with special needs, was 30 percent higher than the cost would have been if no students had had special needs), although the variation across school districts was very low – and neither the average need nor the variation in need across districts changed between 2003-04 and 2008-09. Nonetheless, the average need of districts in the highest need quartile of districts was about 11 percent higher than the average need of districts in the lowest need quartile of districts.

As far as geographic cost differences and the attractiveness of districts to teachers, we have discussed how we created those indices and how they were designed to have a statewide average of 1.00 and the same coefficient of variation; the indices are the same in 2003-04 and 2008-09. It is worth noting that

something over half of all students are enrolled in the highest quartiles of districts in terms of geographic cost and teacher attractiveness.

Property tax effort, expressed as dollars per $100 of equalized assessed value, grew slightly, on average, between 2003-04 and 2008-09 and the disparity in property tax rates was moderate in 2008-09 and had increased slightly over its level in 2003-04. In 2008-09 the average tax rate of districts in the highest tax rate quartile was more than three times as high as the average tax rate of districts in the lowest tax rate quartile although more than half of all students were in districts in the highest tax rate quartile. As mentioned above, in other states a variation in tax effort of the sort that exists in North Carolina, would be indicative of a taxpayer inequity, particularly if local support were required to assure that sufficient revenues were available to provide the programs and services required to meet constitutional expectations.

In Table VI-4 correlations between pairs of factors are shown for 2003-04 and 2008-09. In most cases the factors are only weakly correlated with one another but there are a few exceptions: (1) wealth was negatively correlated with tax effort (that is, wealthier districts tended to have lower tax rates); (2) the geographic cost index was positively correlated with the teacher attractiveness index (that is, districts that were attractive to teachers tended to have higher prices); and both the geographic cost index and the teacher attractiveness index were positively correlated with district size (that is, larger districts were both more attractive to teachers and had higher prices).

Teachers: Disparities

As we mentioned at the beginning of this section of the report, another way to examine school finance equity is by looking at the level of disparity in the resources school districts deploy. While it could be argued that in many states resource usage is under the control of school districts and equity is determined exclusively by revenue levels, in North Carolina, the situation is very different because the state plays such an important role in determining how many teachers school districts employ and how much teachers are paid – in fact, since school districts can hire more teachers than the numbers specified by the state and can pay teachers more than the amount specified in the statewide salary schedule, it is useful to compare the equity of state-determined teacher characteristics (numbers, salary, and education/experience) to the equity of all teacher characteristics.

The figures in Table VI-5 indicate the variation in teacher characteristics using the same format that was used in looking at major sources of revenue. In order to facilitate comparisons among districts, we use the number of teachers per 1,000 students as the indicator of how many teachers are employed (as opposed to student-teacher ratios, which are often misinterpreted to represent actual class size). For example, in 2008-09, the state allotted 48.5 teachers per 1,000 students, on average, with a minimum of 46.2 teachers per 1,000 students and a maximum of 52.1 teachers per 1,000 students across all districts (all of these figures were higher than they had been in 2003-04). The coefficient of variation of allotted teachers per 1,000 students was .021 in 2008-09, indicating almost no variation across school districts (see the quartile values, which show very small differences across districts).

On average, however, school districts added 26.2 teachers per 1,000 students to the state allotment (a 54 percent increase), raising the average number of teachers employed to 74.7 teachers per 1,000 students. As a result, the actual number of teachers employed varied from 62.9 per 1,000 students to 119.4 per 1,000 students although the coefficient of variation remained relatively low at .107. The average number of teachers per 1,000 students in the highest quartile of teachers employed was 27 percent higher than the average number of teachers employed in the lowest quartile (as compared to a 5.5 percent difference for allotted teachers).

The basic characteristics of teachers varied somewhat across school districts (these are characteristics of all teachers employed). In 2008-09, the average years of experience for teachers was 13.4 years, with a range of 9.6 years to 17.3 years across all districts, which resulted in a low coefficient of variation of .101. The proportion of teachers with more than a B.A. degree varied more widely than years of experience: in 2008-09 25.0 percent of teachers had more than a B.A. degree, on average, the range among districts was 13.3 percent to 42.4 percent, and the coefficient of variation was .228, much higher than the case for numbers of teachers and average years of experience.

The amount paid by districts to teachers in excess of the statewide salary schedule varied considerably in 2008-09, providing an average of $2,249 but having a range of zero to $6,650, which produced a coefficient of variation of .604 (somewhat lower than had been the case in 2003-04). On average, districts in the highest quartile of salary supplement paid almost $3,400 more than districts in the lowest quartile of salary supplement.

Teachers: Relationships

The figures in Table VI-6 show the correlations between teacher characteristics and the six explanatory factors used above in order to understand the causes of the variations in those characteristics. In the case of allotted teachers, we are not concerned with the correlations because the variation was so low. For total employed teachers, there is a negative correlation with size and there are positive correlations with need and wealth. The quartile analyses show these relationships more clearly; as district *size* increases, the number of employed teachers per 1,000 students decreases while as district *need* increases, the number of teachers employed per 1,000 students rises.

In terms of average years of experience, because the coefficient of variation was right at .100, we do not show the correlation coefficients for the six explanatory factors. Teacher education level is positively correlated with district wealth and attractiveness and slightly negatively correlated with district need; both of these relationships can be seen in the quartile analyses.

Average salary supplement is correlated with districts size as well as with geographic cost and district attractiveness to teachers. The relationship between salary supplement and size is shown clearly in the quartile analysis, in which as size moves from the smallest to the largest quartile, average salary supplement rises by about $600 between each pair of quartiles. While the quartile analysis suggests a relationship between salary supplement and district wealth for the first three quartiles, districts in the highest wealth quartile, on average, pay a supplement that is slightly higher than the second quartile.

Overview of School Finance Equity in North Carolina

Taking all of the information presented above into consideration, we draw several conclusions about the equity of the school finance system in North Carolina:

1. North Carolina's allotment system, in general, achieves a high level of equality, in terms of both dollars per student and teachers per 1,000 students, across the state's 115 school districts. The variation in state aid per student is relatively low and differences in state aid are appropriately related to district size (smaller districts receiving higher amounts of aid per student) and to district need (needier districts receive more state aid per student) and are neutral with regard to district wealth. To the extent that the courts agree state aid provides a constitutionally satisfactory level of support, and no other revenue is needed by school districts to meet constitutional expectations, these results are admirable.

2. However, every school district supplements state aid and the variation in local revenue per student, and the tax effort made to raise such revenue, is large. Too, the provision of local support leads to variation in the number of teachers per 1,000 students, which did not exist when the number of teachers per 1,000 students supported only by the state was examined. The combination of state and local support mitigates the relationships between revenue and district size and between revenue and district need and creates a positive relationship between revenue and district wealth, which is troubling even if it is not unconstitutional.

3. These results suggest that the state might want to examine more closely those allotments that are specifically designed to consider the size, need, and wealth of school districts in order to be sure that they are working well to accomplish the purposes for which they were created to the highest degree possible. Given that local support is provided at least in part to deal with the financial implications of geographic cost differences, it might also make sense for state aid to take such differences into account in some manner (recognizing that district attractiveness to teachers would need to be considered if state aid were allocated in a way that was sensitive to geographic cost differences across school districts).

TABLE VI-1
VARIATION IN MAJOR SOURCES OF REVENUE PER STUDENT TO NORTH CAROLINA SCHOOL DISTRICTS IN 2003-04 AND 2008-09

	Major Sources of Revenue by Themselves and in Combination											
	State*			Local**			Federal***		State* and Local**		State*, Local**, and Federal***	
	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Basic Statistics												
Simple Average												
All Districts	$4,571	$5,273	15.4%	$967	$1,253	29.6%	$640	$877	$5,538	$6,526	$6,178	$7,199
Percentage of Total	*74.0%*	*71.2%*		*15.7%*	*16.9%*		*10.4%*	*11.8%*				
Variation												
Minimum	$3,650	$4,088	12.0%	$96	$131	36.5%	$284	$380	$4,506	$4,758	$4,854	$5,382
Maximum	$8,399	$11,576	37.8%	$3,440	$4,499	30.8%	$1,724	$2,436	$9,519	$13,557	$10,993	$14,593
Ratio of Max to Min	*2.30*	*2.83*		*35.83*	*34.34*		*6.07*	*6.41*	*2.11*	*2.85*	*2.26*	*2.71*
Coefficient of Variation	0.159	0.204	28.3%	0.565	0.575	1.8%	0.445	0.356	0.142	0.174	0.148	0.174
Quartiles (Each Source and Combinations are Separate)												
Lowest	$3,994	$4,403	10.2%	$446	$556	24.7%	$376	$410	$4,831	$5,562	$5,299	$6,080
Second	$4,267	$4,798	12.4%	$752	$982	30.6%	$497	$561	$5,164	$6,039	$5,787	$6,685
Third	$4,533	$5,268	16.2%	$986	$1,292	31.0%	$639	$693	$5,595	$6,569	$6,289	$7,251
Highest	$5,491	$6,624	20.6%	$1,684	$2,181	29.5%	$1,046	$1,030	$6,565	$7,936	$7,339	$8,783

* State revenue excludes preschool.
** Local revenue excludes community service, nutrition, and adult education.
*** Federal revenue excludes preschool and nutrition.

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

TABLE VI-2

CORRELATIONS BETWEEN MAJOR SOURCES OF REVENUE PER STUDENT AND EXPLANATORY FACTORS FOR NORTH CAROLINA SCHOOL DISTRICTS IN 2003-04 AND 2008-09

	Major Sources of Revenue by Themselves and in Combination											
	State*			Local**			Federal***		State* and Local**		State*, Local**, and Federal***	
	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Basic Statistics												
Simple Average												
All Districts	$4,571	$5,273	15.4%	$967	$1,253	29.6%	$640	$877	$5,538	$6,526	$6,178	$7,199
Percentage of Total	*74.0%*	*71.2%*		*15.7%*	*16.9%*		*10.4%*	*11.8%*				
Correlation with:												
Size	-0.41	-0.36		0.32	0.24		-0.29	-0.25	-0.16	-0.19	-0.23	-0.23
Need	0.42	0.26		-0.18	-0.07		0.55	0.63	0.27	0.21	0.40	0.32
Wealth	0.06	0.07		0.56	0.54		-0.21	-0.17	0.44	0.40	0.31	0.33
Property Tax Effort	-0.16	-0.20		0.34	0.30		0.17	0.28	0.09	0.00	0.13	0.05
Geographic Cost	-0.47	-0.46		0.51	0.49		-0.43	-0.43	-0.08	-0.12	-0.20	-0.21
Teacher Attractiveness	-0.51	-0.60		0.47	0.44		-0.76	-0.75	-0.14	-0.29	-0.36	-0.43
Quartile Analysis:												
Districts by Size												
Lowest Quartile	$5,378	$6,397	18.9%	$751	$986	31.3%	$790	$1,090	$6,129	$7,383	$6,919	$8,246
Second Quartile	$4,523	$5,234	15.7%	$959	$1,328	38.5%	$700	$891	$5,482	$6,562	$6,182	$7,253
Third Quartile	$4,323	$4,888	13.1%	$1,095	$1,353	23.6%	$597	$794	$5,418	$6,240	$6,015	$6,848
Highest Quartile	$4,053	$4,562	12.6%	$1,067	$1,346	26.1%	$471	$730	$5,120	$5,908	$5,590	$6,438
Districts by Need												
Lowest Quartile	$4,324	$4,889	13.1%	$1,066	$1,414	32.6%	$440	$638	$5,389	$6,303	$5,830	$6,771
Second Quartile	$4,357	$5,134	17.8%	$1,055	$1,192	13.0%	$529	$815	$5,412	$6,326	$5,941	$6,950
Third Quartile	$4,575	$5,322	16.3%	$985	$1,215	23.4%	$756	$898	$5,560	$6,537	$6,316	$7,229
Highest Quartile	$5,029	$5,750	14.3%	$763	$1,188	55.7%	$836	$1,158	$5,792	$6,938	$6,628	$7,848
Districts by Wealth												
Lowest Quartile	$4,631	$5,445	17.6%	$713	$887	24.4%	$784	$1,086	$5,344	$6,332	$6,128	$7,180
Second Quartile	$4,428	$4,873	10.0%	$746	$1,030	38.1%	$619	$736	$5,174	$5,903	$5,792	$6,451
Third Quartile	$4,563	$5,287	15.9%	$996	$1,381	38.7%	$599	$872	$5,559	$6,668	$6,158	$7,337
Highest Quartile	$4,663	$5,489	17.7%	$1,414	$1,717	21.4%	$556	$815	$6,077	$7,206	$6,632	$7,835

* State revenue excludes preschool.

** Local revenue excludes community service, nutrition, and adult education.

*** Federal revenue excludes preschool and nutrition.

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

TABLE VI-3

VARIATION IN DISTRICT SIZE, WEALTH, NEED, GEOGRAPHIC COST, TEACHER ATTRACTIVENESS, AND PROPERTY TAX EFFORT FOR NORTH CAROLINA SCHOOL DISTRICTS IN 2003-04 AND 2008-09

Variation	*Size (Enrollment)*				*Wealth (Property Value per Student)*				*Need Index*			
	2003-04		2008-09		2003-04		2008-09		2003-04		2008-09	
	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students
Simple Average	11,401	1,311,163	12,265	1,410,497	$489,214	1,311,163	$682,087	1,410,497	1.30	1,311,163	1.30	1,410,497
Coefficient of Variation	1.472		1.619		0.540		0.779		0.045		0.045	
1st Q (Lowest)	2,037	59,061	1,962	56,892	$269,868	289,421	$332,869	288,715	1.24	316,819	1.24	292,999
2nd Quartile	4,558	132,186	4,519	131,042	$368,689	294,905	$449,407	383,208	1.28	505,517	1.28	264,427
3rd Quartile	8,818	246,900	9,019	252,539	$477,151	314,616	$616,101	535,451	1.31	335,997	1.32	594,087
4th Q (Highest)	30,104	873,016	33,449	970,024	$840,734	412,221	$1,327,458	203,123	1.38	152,830	1.38	258,984

	*Geographic Cost Index**				*Teacher Attractiveness Index**				*Property Tax Effort*			
	2003-04		2008-09		2003-04		2008-09		2003-04		2008-09	
	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students	Quartile Average	Number of Students
Simple Average	1.00	1,311,163	1.00	1,410,497	1.00	1,311,163	1.00	1,410,497	0.27	1,311,163	0.28	1,410,497
Coefficient of Variation	0.046		0.046		0.047		0.047		0.552		0.585	
1st Q (Lowest)	0.95	103,551	0.95	101,991	0.94	140,506	0.94	132,182	0.154	119,334	0.138	104,398
2nd Quartile	0.98	244,881	0.98	245,026	0.99	263,908	0.99	270,359	0.226	221,048	0.233	275,076
3rd Quartile	1.00	285,376	1.00	288,863	1.02	282,527	1.02	289,394	0.270	376,082	0.289	304,576
4th Q (Highest)	1.07	677,355	1.07	774,617	1.06	624,222	1.06	718,562	0.418	594,699	0.441	726,447

Note: In terms of numbers of districts, the 1st, 2nd, and 4th quartiles always have 29 districts while the 3rd quartile has 28 districts.

* Because both the Geographic ost Index and the Teacher Attractiveness Index are constant for both years, all statistics are the same for both years.

TABLE VI-4

CORRELATIONS BETWEEN PAIRS OF EXPLANATORY VARIABLES IN 2003-04 AND IN 2008-09

Explanatory Variables	Explanatory Variables					
	Size	Wealth	Effort	Need	GCI*	TAI*
	2003-04					
District Size	1.00	-0.01	0.13	-0.17	0.48	0.41
District Wealth		1.00	-0.33	-0.22	0.07	0.37
District Tax Effort			1.00	0.14	0.22	-0.05
District Need				1.00	-0.26	-0.45
Geographic Cost Index (GCI)*					1.00	0.56
Teacher Attractiveness Index (TAI)*						1.00

	2008-09					
	Size	Wealth	Effort	Need	GCI	TAI
District Size	1.00	-0.10	0.17	-0.02	0.48	0.43
District Wealth		1.00	-0.37	-0.15	-0.01	0.27
District Tax Effort			1.00	0.20	0.29	0.00
District Need				1.00	-0.09	-0.17
Geographic Cost Index (GCI)*					1.00	0.56
Teacher Attractiveness Index (TAI)*						1.00

Note: The correlation coefficients are shown for pairs of variables based on the row and column that cross a single coefficient. The correlation ranges from .00 to 1.00 and can be positive or negative. The coefficient is always 1.00 when a variable is correlated with itself.

* The Geographic Cost Index (GCI) and the Teacher Attractiveness Index (TAI) are the same in both years.

TABLE VI-5
VARIATION IN TEACHER CHARACTERISTICS FOR NORTH CAROLINA SCHOOL DISTRICTS IN 2003-04 AND 2008-09

	Number of Teachers, Characteristics of Teachers , and Teacher Salary Supplement									
	Teachers per 1,000 Students Allotted		Teachers per 1,000 Students Employed		Average Years of Experience		Percentage of Teachers with More than a B.A.		Average Salary Supplement	
	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Basic Statistics										
Simple Average										
All Districts	47.2	48.5	71.5	74.7	13.6	13.4	24.8%	25.0%	$1,658	$2,249
Variation										
Minimum	43.4	46.2	38.7	62.9	9.6	9.6	11.6%	13.3%	$0	$0
Maximum	51.2	52.1	108.1	119.4	17.5	17.3	43.4%	42.4%	$5,755	$6,650
Ratio of Max to Min	*1.18*	*1.13*	*2.79*	*1.90*	*1.82*	*1.80*	*3.74*	*3.19*	--	--
Coefficient of Variation	0.025	0.021	0.106	0.107	0.100	0.101	0.245	0.228	0.682	0.604
Quartiles (Each Character-istic is Separate)										
Lowest	46.0	47.4	64.1	67.3	11.8	11.7	18.2%	18.6%	$382	$687
Second	46.8	48.1	68.8	71.4	13.1	13.0	22.0%	22.8%	$1,227	$1,785
Third	47.3	48.7	72.2	74.8	14.0	13.7	26.1%	26.1%	$1,906	$2,471
Highest	48.7	50.0	81.0	85.4	15.3	15.1	32.9%	32.8%	$3,124	$4,062

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

TABLE VI-6

CORRELATION BETWEEN TEACHER CHARACTERISTICS AND EXPLANATORY FACTORS FOR NORTH CAROLINA SCHOOL DISTRICTS IN 2003-04 AND 2008-09

	Number of Teachers, Characteristics of Teachers , and Teacher Salary Supplement									
	Teachers per 1,000 Students Allotted		Teachers per 1,000 Students Employed		Average Years of Experience		Percentage of Teachers with More than a B.A.		Average Salary Supplement	
	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09	2003-04	2008-09
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Basic Statistics										
Simple Average										
All Districts	47.2	48.5	71.5	74.7	13.6	13.4	24.8%	25.0%	$1,658	$2,249
Correlation with:										
Size			-0.25	-0.25			0.04	0.12	0.61	0.56
Need			0.35	0.28			-0.29	-0.22	-0.14	0.04
Wealth			0.37	0.36			0.45	0.38	0.15	0.09
Property Tax Effort			0.02	0.06			-0.09	-0.09	0.27	0.28
Geographic Cost			-0.20	-0.22			0.11	0.20	0.64	0.61
Teacher Attractiveness			-0.23	-0.27			0.32	0.43	0.60	0.60
Quartile Analysis:										
Districts by Size										
Lowest Quartile			77.8	81.5			25.3%	23.8%	$951	$1,323
Second Quartile			71.4	75.7			24.8%	26.2%	$1,347	$1,989
Third Quartile			70.1	71.4			24.6%	24.5%	$1,886	$2,542
Highest Quartile			66.7	70.2			24.5%	25.6%	$2,455	$3,153
Districts by Need										
Lowest Quartile			67.9	71.6			26.6%	26.1%	$1,655	$2,311
Second Quartile			72.0	73.7			26.8%	25.9%	$2,010	$1,949
Third Quartile			70.4	74.5			22.7%	25.0%	$1,603	$2,509
Highest Quartile			75.8	79.1			23.1%	23.2%	$1,362	$2,236
Districts by Wealth										
Lowest Quartile			69.6	73.7			21.8%	21.5%	$1,306	$1,964
Second Quartile			68.8	71.3			22.9%	23.7%	$1,477	$2,106
Third Quartile			72.2	75.4			25.3%	26.1%	$1,951	$2,745
Highest Quartile			75.4	78.6			29.3%	28.9%	$1,907	$2,199

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

VII. Evaluation of Individual State Allotments

Having examined the overall equity of school finance in North Carolina in the previous chapter, it is important to take a look at the individual allotments, or groups of allotments, that combine to create what we referred to as state support in the previous chapter (we exclude state aid for personnel benefits in both chapters). As we discussed earlier, the state uses numerous allotments to provide support to school districts. The allotments can be categorized into three basic types: (1) position allotments, which are based on numbers of personnel and statewide salary schedules; (2) dollar allotments, which are based on fixed amounts of money per some specified number of units, such as all students or a subset of students (such as those in special education programs); and (3) complex formulas that are designed to focus state funds on districts with particular characteristics, such as enrollment level or wealth.

It is possible to look at individual allotments in the same way that we examined the equity of total state support – by examining the variation in per student revenue for each allotment and by examining the relationships between per student revenues and six explanatory factors (size, need, wealth, tax effort, geographic cost differences, and teacher attractiveness). Such an examination allows us to determine in general whether allotments are meeting the objectives for which they were created and to note particular strengths or weaknesses of individual allotments.

The figures in Tables VII-1A, VII-1B, and VII-1C show a variety of information about the per student amount of revenue for each of 22 allotments (or in one case, group of allotments) including: (1) the simple average across 115 school districts (this is not the accounting average for the state as a whole but simply the average of the per student amounts of the 115 districts); (2) the minimum and maximum amounts among the districts; (3) the coefficient of variation across all districts; (4) the quartile averages of per student aid for each allotment; (5) the correlation coefficients between the per student amount of state support and the six explanatory factors; and (6) quartile averages of per student aid for three explanatory factors (size, need, and wealth).

Data are shown for 2003-04 and 2008-09 – this means that some allotments may have been created after 2003-04 while others may have been eliminated before 2008-09 so one of the years may show zero values for the amount of the allotment; of course other changes have taken place since 2008-09 that are not taken into account in the information shown in the tables. The allotments are shown in order (left to right) of proportion of total state support in 2008-09 (see the highlighted grey boxes). When the variation in state aid per student is low (a coefficient of variation less than .100), then the correlation coefficients and associated quartile averages are not shown because they can be misleading (that is, an anomaly in the data can produce a moderate correlation when the actual difference between districts is small enough not to matter). Finally, the type of each allotment (position, dollar amount, complex formula) is shown just below the allotment description.

Classroom Teachers

The largest allotment by far is the one that supports classroom teachers. This provided $2,230 per student, on average, across the 115 districts in 2008-09. It is worth noting that, while the allotment was responsible for 46.0 percent of all state aid in 2008-09, this proportion dropped a bit between 2003-04 and 2008-09. This was true despite the fact that the average level of support rose by 14.4 percent (an increase of about 2.7 percent per year) over the same time. This suggests that total state aid expanded more than aid for classroom teachers did over the five year period.

Despite the fact that maximum classroom teacher aid per student was 1.6 times as high as minimum classroom teacher aid per student, the variation across all districts was small (the coefficient of variation was .081). The variation in per-student classroom teacher aid among districts primarily reflects the characteristics of the teachers school districts choose to hire. Previously we have shown that both years of experience and proportion of teachers with more than a B.A. degree varies across school districts. This leads to teachers earning more, on average, in one district as compared to another, resulting in per student amounts of state support that vary. This outcome is not driven by district size since student to teacher ratios do not vary by district size within the classroom teacher allotment. Therefore, we conclude that the classroom teacher allotment is equitable although it favors districts that employ teachers with higher levels of experience and education and does not take into consideration uncontrollable cost pressures associated with district characteristics, such as size or geographic cost of living, or with student characteristics.

Children with Disabilities (Special Education)

The second largest allotment is the one for children with disabilities, which encompassed 9.5 percent of all state support in 2008-09 and provided an average of $453 per student (all students, not just students in special education programs) across the 115 school districts. Although this allotment provided the same amount of support for each eligible student (up to a limit of 12.5 percent of all students in a district) it generated between $293 and $600 per all students, which is one indication of the extent of the variation across districts in the proportion of students participating in special education programs.

Nonetheless, the overall variation in the amount allotted per all students was relatively low (the coefficient of variation was .118 in 2008-09, which was similar to its level in 2003-04). The allotment is distributed in a way that is neutral in regard to district wealth and mildly sensitive to district need (again, district need includes more groups of students with special needs than just those students in special education programs).

Because this allotment focuses on special education, we delved further into the issue by looking at how enrollment in special education programs has changed over time. We found that, on average, the proportion of students identified as needing special education decreased from 15.2 percent of all students in 2003-04 to 12.2 percent of all students in 2008-09 and that the number of districts having more than 12.5 percent of all students in special education programs declined from 103 districts in 2003-04 to 50 districts in 2008-09 (nonetheless, there are districts that have a higher proportion of students than the proportion for which the state provides support).

Since state support is a flat amount for each child in special education (up to the limit), we also looked at the distribution of students in special education based on the relative cost of their disabilities. We placed students in three categories: mild, moderate, and severe, which combine groups of disabilities that, based on our experience, are similar in cost. Disabilities in the "mild" category have relatively low costs, disabilities in the "moderate" category have moderate costs, and disabilities in the "severe" category have very high costs.

We found that while most students in special education programs were in the mild category (the simple average proportion across the 115 districts in 2008-09 was 8.9 percent of all students or about 70 percent of all students with disabilities), the variation in the proportion of students across the 115 districts was much higher in the moderate and severe categories. In fact, the average proportion was 2.7 percent of all students for the moderate category, the coefficient of variation was over .300, and the ratio of the highest proportion to the lowest proportion across the 115 districts in 2008-09 was five to one. In the severe category, the average proportion was 0.8 percent of all students, the coefficient of variation was over .300, and the ratio of the highest proportion to the lowest proportion across the 115 districts in 2008-09 was seven to one.

Allotments That Each Provided 4-6 Percent of Total State Aid in 2008-09

There were four allotments that each provided between four and six percent of total state support in 2008-09:

(1) Instructional support personnel;
(2) Teacher assistants;
(3) Career technical/vocational education; and
(4) Non-instructional support personnel.

In the case of three allotments (instructional support personnel, teacher assistants, and non-instructional support personnel), the variation in per student revenue was very low, indicating that the distribution of funds was equitable. At the same time, the correlations between the per student amounts and the explanatory factors for those three allotments were low, indicating that whatever variation did exist was unrelated to the factors. We think it is of some concern that there is not a stronger negative correlation between those allotments and district size given the needs of smaller districts for relatively more personnel.

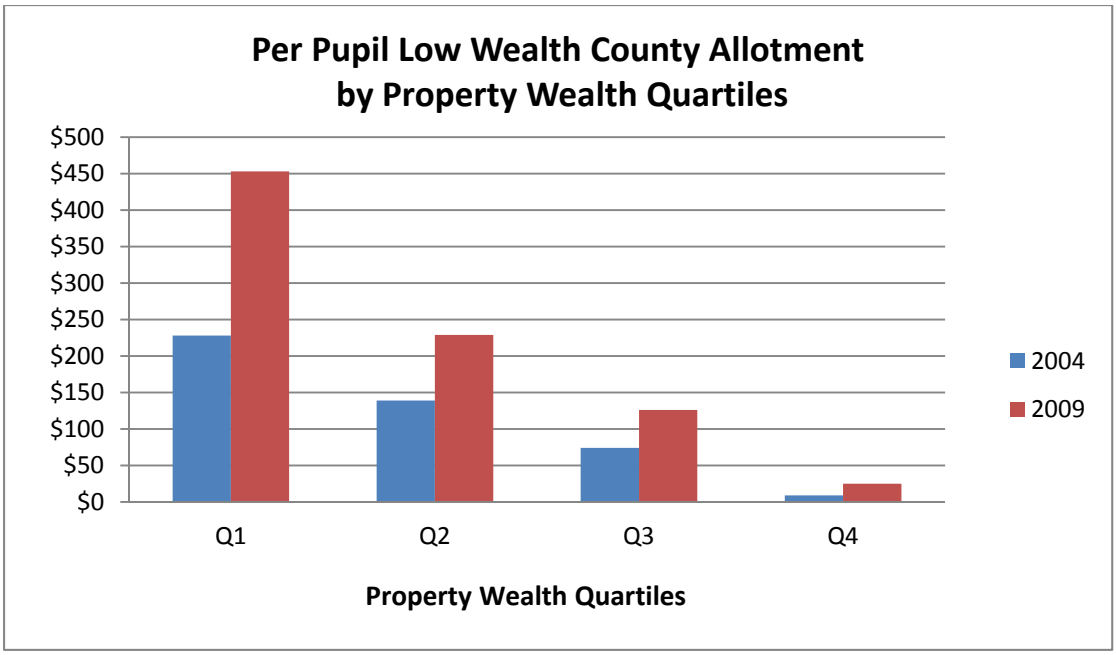
The allotment for career-technical/vocational education did vary somewhat across districts and was negatively correlated with district size, the GCI and the TAI. We are concerned about the negative relationship to the GCI, which indicates that the amount of money distributed is not sensitive to the prices districts must pay for personnel.

Allotments That Each Provide 1-4 Percent of State Aid in 2008-09

There were 11 allotments that each provided between one and four percent of total state support in 2008-09: (1) school building administration; (2) at-risk students; (3) low wealth counties; (4) central office administration; (5) textbooks; (6) ABC incentive awards; (7) classroom materials; (8) other regular instruction (a combination of numerous small allotments); (9) limited-English proficiency (LEP); (10) disadvantaged student supplement; and (11) academically-intellectually gifted. In the case of three of these allotments (textbooks, classroom materials, and gifted), there was almost no variation in per student allotment revenue across school districts, which is what would be expected since allotments are based on numbers of students (even in the case of gifted students, which in our view reasonably assumes that the proportion of students identified as gifted is constant across districts).

In the case of four other allotments (school building administration, at-risk, other regular instruction, and ABC incentive awards), the variation in per student revenue was moderate. For school building administration, at-risk, and other regular instruction, funding was inversely associated with district size and not correlated with district wealth. Both the at-risk and other regular instruction allotments were related to district need. Other than the fact that funds were negatively related to the GCI, these three allotments appear to operate well. The ABC incentive award was related to wealth and unrelated to need, probably reflecting the relationship between performance and wealth.

The other four allotments (low wealth county, central office administration, LEP, and disadvantaged student supplement) varied widely, making it more important to examine the relationships of their per student amounts to the explanatory factors. The low wealth county allotment was negatively correlated with both wealth (although the strength of the relationship has deteriorated a bit over time) and the attractiveness of counties to teachers. As shown in the chart below, the quartile averages indicate that low wealth allotment levels were very sensitive to wealth (declining from $453 to $229, to $126, to $25 per student). These figures suggest that the low wealth county allotment was working well.



The central office administration allotment was negatively correlated with district size (the quartile averages show the relationship clearly) and somewhat positively related to need (the quartile averages suggest that amounts were fairly consistent until need became relatively high, when the amount rose considerably). It appears that the central office administration allotment also works reasonably well.

The LEP allotment is strongly associated with need and unrelated to the other explanatory factors; the quartile averages increase from $21, to $31, to 45, to $94 per student as district need rises, suggesting that the allotment is working well. The disadvantaged student supplement is also positively related to district need (although not to the same extent as the LEP allotment) and negatively associated with the TAI, both of which indicate that the allotment works quite well. At the same time, the disadvantaged student supplement operates in a way that is similar to the at-risk allotment although it is even more sensitive to both district size and district need. The ratio of the quartile averages in 2008-09 for the two allotments are shown below:

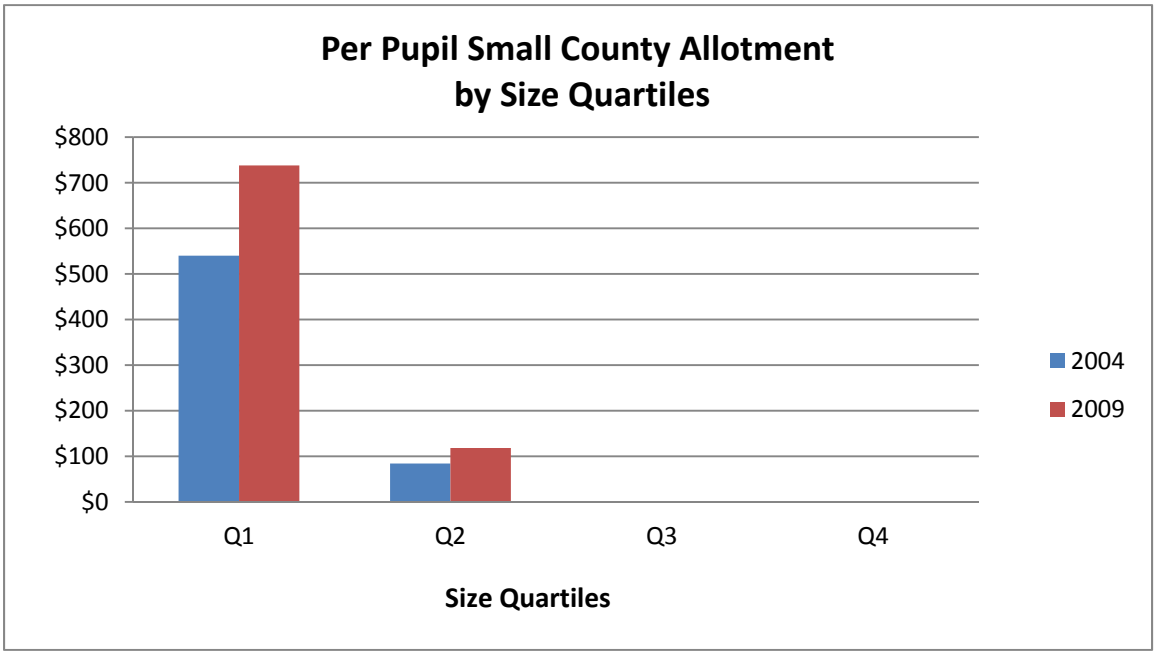
	At-Risk	Disadvantaged Student Supplement
Size (Ratio of Lowest to Highest Quartile)	1.51	2.16
Need (Ratio of Highest to Lowest Quartile)	1.49	2.58

While the Disadvantaged Student Supplement Allotment provides less revenue than the At-Risk Allotment, its sensitivity to district size and need is greater. If the two allotments are meant to accomplish the same result (to provide more state support to districts with greater needs while also being sensitive to district size), and both do so, then there is no need to have separate allotments (particularly when they use different methods of specifying the population being supported).

Allotments That Each Provide Less than One Percent of State Aid in 2008-09

There were four allotments that each provided less than one percent of all state aid (the small county supplement, miscellaneous grants, school connectivity, and improved student accountability). Setting aside the allotment for improved student accountability (for which no funds were distributed in 2008-09), the other three vary enormously across school districts (with coefficients of variation in excess of 1.500), clearly focusing on a small subset of school districts. That is, the districts in the highest quartile receive vastly more per student funds, on average, than any other quartile.

Looking at the quartile averages for districts organized by size, need, and wealth, all three allotments focus more funds on small districts than on larger districts and both the small county supplement and school connectivity allotment provide more funds to wealthy districts and are neutral in terms of need while the miscellaneous grants are sensitive to need but not to district wealth. The graph below shows the distribution of the small county allotment to quartiles of districts of different size.



Because district size and wealth are not correlated, we wonder about the effectiveness of the small county supplement and the school connectivity allotments. The miscellaneous grants appear to operate reasonably well.

Transportation and Lottery Funds

We kept the allotment for transportation and the distribution of Lottery funds separate from the other allotments for several reasons: (1) they do not deal with instructional items; (2) the revenue provided for these items is not flexible in the way that revenue for many other allotments has become more flexible in the last few years; and (3) these allotments have received more attention than many of the others.

Transportation

The allotment for transportation varies considerably across school districts although that variation is unrelated to the explanatory factors. Transportation, however, is a special case since the factors that drive transportation costs are very different from those that drive most other costs. After reviewing the transportation allotment, APA's conclusion is that its structure is appropriate. The formula reimburses districts a proportion of their eligible transportation expenditures based on a multi-faceted efficiency measure. The most efficient districts are reimbursed 100 percent of their eligible expenditures, while less efficient districts must contribute a locally funded amount or reduce expenditures. Consequently, the critical aspect of the formula is the determination of district efficiency or the budget rating.

It is important to note that efficiency or the budget rating is not measured in abstract, but is a comparison of each district's operation with the operation of all other districts in the state. The benchmarks for a district's budget rating are the most efficient school districts. The pupil transportation funding system works because the primary components of the budget rating include the key items of an efficiency measure.

The measure of keeping costs low is Cost Efficiency, which is based on expenditure per student; and the measure of an efficient operation is Bus Efficiency (buses per 100 students transported) which indicates bus utilization and the extent to which the district's bus capacity is employed. Combining these two components into a single overall efficiency measure for each district blends the importance of these two aspects of operating pupil transportation and reduces the distortions that would occur using only one component. As the budget ratings are recalculated each year, the funding formula maintains pressure on districts to improve their operations (and raise their budget rating) both to increase their state reimbursement percentage and to protect their relative position compared to the most efficient districts.

Over the years there has been an ongoing effort to adjust districts' budget ratings to reflect the site characteristics that influence their costs and operating abilities. The primary site characteristic that has proven important for adjusting bus efficiency is average pupil distance to school. For cost efficiency, the most important site characteristic is pupil density (students transported per mile of road). The effect of these statistical adjustments is to narrow the distribution of the efficiency measures to take into account site characteristics over which the districts have no control. This is a necessary step to avoid penalizing some districts unfairly and rewarding others unnecessarily.

Another important feature and possible concern is the growth of eligible expenditures from year to year. Eligible local expenditures, which are funded by school districts in year one, are added to the eligible state expenditures in that year to become the districts' funding base in year two. Districts that are fiscally able and willing to fund eligible expenditures for the first year can increase their funding base and have the state pay for these expenditures in the second and succeeding years at the level of their budget rating. Districts with a growth of expenditures beyond an expected level have their capped

expenditures excluded from expenditures eligible for reimbursement. To date this has only affected a few districts and has not proven to be a substantial fiscal issue.

We were concerned about the possible impact of the fact that when the transportation formula was created 20 years ago it was built on individual district spending levels at that time. While this could have created an equity issue – that wealthy districts may have been spending more than poorer districts – the current correlations between wealth and total spending for transportation and local spending for transportation, while positive, are low. Regardless of wealth, the spending caps included in the allotment procedure could make it difficult for districts to deal with circumstances that have nothing to do with population growth and inflation.

Lottery Funds

Dollars from state lottery revenues are distributed to school districts to help address capital needs. Historically the allotment has been distributed in two ways. First, 65 percent of the available revenues have been distributed based on a per ADM amount. Second, the remaining 35 percent of the funds are distributed to districts which reside in a county with a higher than average effective tax rate. Eligible districts are identified each year and then the remaining dollars are divided by the ADM of the eligible districts and distributed on a per ADM amount. This structure incentivizes districts to have a higher than average effective tax effort in order to receive these additional dollars. APA analyzed figures for this allotment for the 2006-07, 2007-08, 2008-09 and 2009-10 school years. In some of the years of analysis the allotment was distributed as described above. In a few years, and currently, the allotment has been adjusted to distribute the same dollars per ADM regardless of tax effort.

APA focused its analysis on the original distribution process. We analyzed the allotment in a manner similar to our other allotment analyses, focusing on the quartiles, and we also looked at the change of effective tax efforts over time (to examine the incentive embedded in the formula.) Our quartile analysis shows the per pupil amount from the allotment goes up as the district gets larger, as the district gets more needy and as the district's education-specific tax rate gets larger. At the same time, the per pupil amount goes down as district wealth rises. Overall, these trends show an allotment that is sensitive to a number of important factors and is helping needier, less wealthy districts receive more funds for capital. Of course, the current trend toward simply distributing the allotment on a per-student amount to all districts will mitigate these effects.

Our analysis of the allotment's effect on overall effective tax effort showed that average tax effort has actually decreased over the period of analysis. It is important to remember that these tax effort figures are total county effort figures and are not specific to schools. This means that a number of other factors could be affecting the movement of these figures, including the frequency of property revaluation.

TABLE VII-1A

STATISTICS FOR INDIVIDUAL ALLOTMENTS IN NORTH CAROLINA IN 2003-04 AND 2008-09

Basic Statistics	Classroom Teachers			Children with Disabilities (Excluding PreK)			Instructional Support Personnel			Teacher Assistants			Career-Technical/Vocational Education			Non-Instructional Support Personnel			Transportation		
	Position			*Dollar Amount*			*Position*			*Dollar Amount*			*Position*			*Dollar Amount*			*Complex Formula*		
	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Simple Average																					
All Districts	$1,950	$2,230	14.4%	$405	$453	11.9%	$214	$247	15.4%	$187	$247	32.1%	$216	$241	11.6%	$152	$200	31.4%	$132	$185	39.7%
Percentage of All Allotments	48.0%	46.0%		9.9%	9.5%		5.4%	5.2%		4.7%	5.1%		4.7%	4.3%		4.0%	4.3%		3.6%	4.1%	
Variation																					
Minimum	$1,554	$1,895	21.9%	$307	$293	-4.6%	$181	$177	-2.2%	$89	$124	39.3%	$140	$168	20.0%	$77	$118	52.7%	$4	$26	548.1%
Maximum	$2,513	$3,115	24.0%	$553	$600	8.5%	$329	$306	-7.0%	$254	$306	20.5%	$472	$511	8.3%	$177	$321	81.0%	$282	$360	27.5%
Ratio of Max to Min	1.6	1.6		1.8	2.0		1.8	1.7		2.9	2.5		3.4	3.0		2.3	2.7		69.4	13.7	
Coefficient of Variation	0.078	0.081		0.106	0.118		0.097	0.087		0.130	0.117		0.237	0.246		0.097	0.131		0.371	0.359	
Quartiles																					
Lowest	$1,857	$2,102	13.2%	$382	$427	11.8%	$203	$238	17.2%	$178	$239	34.3%	$183	$201	9.8%	$143	$184	28.3%	$108	$148	36.1%
Second	$1,934	$2,235	15.6%	$401	$461	15.0%	$210	$247	17.6%	$191	$249	30.4%	$195	$227	16.4%	$152	$201	32.7%	$126	$181	43.2%
Third	$2,029	$2,346	15.6%	$423	$480	13.5%	$222	$257	15.8%	$202	$263	30.2%	$237	$264	11.4%	$164	$216	31.4%	$162	$228	40.8%
Highest	$2,513	$3,115	24.0%	$553	$600	8.5%	$329	$306	-7.0%	$254	$306	20.5%	$472	$511	8.3%	$177	$321	81.0%	$282	$360	27.5%
Correlation with:																					
Size				-0.32	-0.14					-0.10	-0.22		-0.44	-0.43		0.12	-0.02		0.11	0.04	
Need				0.46	0.21					0.05	0.20		0.25	0.11		-0.08	0.06		0.02	-0.14	
Wealth				0.03	0.09					-0.01	-0.04		0.13	0.18		0.05	0.08		0.08	0.09	
GCI				-0.31	-0.18					0.00	-0.13		-0.45	-0.46		0.16	-0.08		-0.12	-0.18	
TAI				-0.40	-0.25					0.20	-0.06		-0.41	-0.44		0.16	0.03		-0.21	-0.31	
Quartile Analysis:																					
Districts by Size																					
Lowest Quartile				$434	$472	8.8%				$186	$244	31.2%	$280	$316	12.9%	$147	$202	37.5%	$143	$207	44.4%
Second Quartile				$409	$465	13.7%				$184	$252	37.0%	$217	$240	10.6%	$154	$204	32.2%	$131	$184	40.9%
Third Quartile				$397	$435	9.6%				$191	$251	31.4%	$190	$216	13.7%	$154	$195	26.7%	$129	$179	39.1%
Highest Quartile				$381	$441	15.7%				$187	$241	28.9%	$177	$192	8.5%	$154	$199	29.2%	$127	$169	33.8%
Districts by Need																					
Lowest Quartile				$382	$427	11.8%				$192	$244	27.1%	$210	$235	11.9%	$155	$198	28.1%	$118	$177	51.0%
Second Quartile				$405	$458	13.1%				$180	$242	34.4%	$210	$242	15.2%	$152	$197	29.0%	$151	$194	28.6%
Third Quartile				$402	$469	16.7%				$185	$247	33.5%	$205	$229	11.7%	$153	$206	34.8%	$134	$197	47.6%
Highest Quartile				$433	$462	6.7%				$190	$256	34.7%	$240	$258	7.5%	$149	$199	33.8%	$127	$171	34.4%
Districts by Wealth																					
Lowest Quartile				$413	$451	9.2%				$186	$250	34.4%	$217	$239	10.1%	$152	$193	27.2%	$123	$179	46.0%
Second Quartile				$390	$435	11.5%				$187	$251	34.2%	$202	$213	5.4%	$149	$203	35.6%	$127	$162	27.6%
Third Quartile				$409	$457	11.7%				$188	$239	27.1%	$220	$248	12.7%	$154	$203	31.7%	$124	$192	54.7%
Highest Quartile				$409	$472	15.4%				$187	$248	32.6%	$227	$264	16.3%	$153	$201	31.2%	$155	$207	33.1%

* Miscellaneous Grants includes Child & Family Support Team Nurses and Social Workers, Learn and Earn,Assistant Principal Intern and MSA grants, Focused Education Reform Pilots, and School Technology Pilots.

** Other Regular Instruction includes Drivers Training, School Technology, Mentors, Staff Development, and Literacy Coaches

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

TABLE VII-1B
STATISTICS FOR INDIVIDUAL ALLOTMENTS IN NORTH CAROLINA IN 2003-04 AND 2008-09

Basic Statistics	School Building Adminstration *Position*			At-Risk/Alternative School *Dollar Amount*			Low Wealth Counties Supplement *Complex Formula*			Central Office Adminstration *Position*			Textbooks *Dollar Amount*			ABC Incentive Awards *Dollar Amount*			Classroom Materials *Dollar Amount*		
	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change
	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)	(41)	(42)
Simple Average																					
All Districts	$187	$203	8.6%	$155	$186	20.0%	$113	$209	85.0%	$123	$150	21.6%	$57	$69	21.1%	$109	$70	-35.8%	$48	$61	27.1%
Percentage of All Allotments	4.2%	3.7%		3.4%	3.4%		1.9%	2.9%		1.6%	1.5%		1.5%	1.5%		2.7%	1.4%		1.2%	1.3%	
Variation																					
Minimum	$49	$43	-12.2%	$99	$116	17.2%	$0	$0	-	$29	$26	-9.1%	$53	$66	24.5%	$67	$28	-58.2%	$44	$58	31.8%
Maximum	$383	$487	27.2%	$408	$548	34.3%	$395	$650	64.6%	$634	$830	31.0%	$61	$74	21.3%	$187	$115	-38.5%	$51	$65	27.5%
Ratio of Max to Min	7.8	11.3		4.1	4.7		-	-		21.8	31.4		1.2	1.1		2.8	4.1		1.2	1.1	
Coefficient of Variation	0.230	0.289		0.277	0.314		0.911	0.917		0.801	0.856		0.020	0.018		0.169	0.225		0.020	0.018	
Quartiles																					
Lowest	$165	$175	6.1%	$129	$153	18.6%	$0	$0	-	$62	$71	15.5%	$57	$68	19.3%	$99	$60	-39.4%	$47	$60	27.7%
Second	$177	$189	6.8%	$149	$176	18.1%	$101	$169	67.3%	$91	$105	14.7%	$57	$69	21.1%	$107	$68	-36.4%	$47	$61	29.8%
Third	$203	$225	10.8%	$168	$204	21.4%	$203	$349	71.9%	$147	$174	18.5%	$58	$70	20.7%	$117	$79	-32.5%	$48	$61	27.1%
Highest	$383	$487	27.2%	$408	$548	34.3%	$395	$650	64.6%	$634	$830	31.0%	$61	$74	21.3%	$187	$115	-38.5%	$51	$65	27.5%
Correlation with:																					
Size	-0.38	-0.35		-0.34	-0.30		-0.25	-0.24		-0.42	-0.39					-0.16	-0.19				
Need	0.26	0.12		0.56	0.44		0.36	0.15		0.26	0.16					0.37	0.01				
Wealth	0.13	0.16		-0.05	0.01		-0.66	-0.55		0.08	0.16					0.12	0.29				
GCI	-0.47	-0.40		-0.46	-0.42		-0.38	-0.32		-0.43	-0.44					0.00	-0.08				
TAI	-0.47	-0.55		-0.65	-0.65		-0.74	-0.67		-0.41	-0.46					-0.03	0.06				
Quartile Analysis:																					
Districts by Size																					
Lowest Quartile	$220	$246	11.8%	$190	$232	22.1%	$127	$219	72.4%	$248	$313	26.4%				$117	$78	-33.3%			
Second Quartile	$192	$217	13.0%	$155	$184	18.7%	$127	$219	72.4%	$117	$139	19.3%				$107	$70	-34.6%			
Third Quartile	$184	$186	1.1%	$145	$172	18.6%	$119	$252	111.8%	$78	$90	15.3%				$109	$69	-36.7%			
Highest Quartile	$153	$162	5.9%	$129	$154	19.4%	$79	$147	86.1%	$48	$53	12.1%				$104	$65	-37.5%			
Districts by Need																					
Lowest Quartile	$176	$197	11.9%	$134	$155	15.7%	$83	$185	122.9%	$105	$132	25.6%				$104	$71	-31.7%			
Second Quartile	$185	$198	7.0%	$138	$177	28.3%	$73	$184	152.1%	$115	$141	22.4%				$107	$68	-36.4%			
Third Quartile	$182	$189	3.8%	$154	$178	15.6%	$124	$219	76.6%	$98	$123	25.6%				$104	$71	-31.7%			
Highest Quartile	$206	$228	10.7%	$194	$231	19.1%	$172	$248	44.2%	$172	$201	16.4%				$122	$72	-41.0%			
Districts by Wealth																					
Lowest Quartile	$183	$207	13.1%	$169	$206	21.9%	$228	$453	98.7%	$122	$143	16.9%				$106	$65	-38.7%			
Second Quartile	$181	$186	2.8%	$145	$161	11.0%	$139	$229	64.7%	$100	$93	-6.7%				$107	$66	-38.3%			
Third Quartile	$188	$200	6.4%	$154	$188	22.1%	$74	$126	70.3%	$128	$173	34.6%				$114	$74	-35.1%			
Highest Quartile	$196	$218	11.2%	$151	$188	24.5%	$9	$25	177.8%	$141	$190	34.3%				$111	$77	-30.6%			

* Miscellaneous Grants includes Child & Family Support Team Nurses and Social Workers, Learn and Earn,Assistant Principal Intern and MSA grants, Focused Education Reform Pilots, and School Technology Pilots.

** Other Regular Instruction includes Drivers Training, School Technology, Mentors, Staff Development, and Literacy Coaches

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

TABLE VII-1C

STATISTICS FOR INDIVIDUAL ALLOTMENTS IN NORTH CAROLINA IN 2003-04 AND 2008-09

Basic Statistics	Other Regular Instruction**			Limited English Proficiency			Disadvantage Student Supplement			Academically-Intellectually Gifted			Small County Supplement			Miscellaneous Grants*			School Connectivity			Improved Student Accountability		
	Dollar Amount			*Dollar Amount*			*Complex Formula*			*Dollar Amount*			*Complex Formula*			*Various*			*Dollar Amount*			*Dollar Amount*		
	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change
	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)	(59)	(60)	(61)	(62)	(63)	(64)	(65)	(66)
Simple Average																								
All Districts	$39	$54	38.5%	$29	$48	65.5%	$0	$78	-	$36	$48	33.3%	$157	$216	37.6%	$3	$54	1,700.0%	$0	$9	-	$27	$0	-100.0%
Percentage of All Allotments	0.9%	1.2%		0.7%	1.1%		0.0%	1.1%		0.9%	1.0%		0.6%	0.7%		0.1%	0.6%		$0	0.2%		0.7%	0.0%	-100.0%
Variation																								
Minimum	$30	$43	43.3%	$0	$0	-	$0	$24	-	$33	$46	39.4%	$0	$0	-	$0	$0	-	$0	$0	-	$12	$0	-100.0%
Maximum	$65	$152	133.8%	$178	$219	23.0%	$0	$313	-	$40	$51	27.5%	$2,018	$2,975	47.4%	$20	$837	4,085.0%	$0	$133	-	$56	$0	-100.0%
Ratio of Max to Min	2.2	3.5		-	-		-	13.0		1.2	1.1		-	-		-	-		-	-		4.7	-	
Coefficient of Variation	0.159	0.293		1.206	0.960	-20.4%	-	1.001	-	0.021	0.018		2.237	2.283		1.601	1.960		-	1.539		0.311	-	-100.0%
Quartiles																								
Lowest	$35	$51	45.7%	$9	$18	100.0%	$0	$32	-	$36	$47	30.6%	$0	$0	-	$0	$0	-	$0	$5	-	$21	$0	-100.0%
Second	$37	$57	54.1%	$16	$32	100.0%	$0	$53	-	$36	$48	33.3%	$0	$0	-	$0	$17	-	$0	$7	-	$26	$0	-100.0%
Third	$40	$70	75.0%	$34	$54	58.8%	$0	$66	-	$37	$48	29.7%	$0	$189	-	$5	$55	1,108.2%	$0	$10	-	$30	$0	-100.0%
Highest	$65	$152	133.8%	$178	$219	23.0%	$0	$313	-	$40	$51	27.5%	$2,018	$2,975	47.4%	$20	$837	4,153.8%	$0	$133	-	$56	$0	-100.0%
Correlation with:																								
Size	-0.30	-0.27		-0.06	0.04		-	-0.20					-0.26	-0.23		0.18	-0.16		-	-0.08		-0.11	-	
Need	0.28	0.34		0.50	0.72		-	0.39					0.17	0.04		0.08	0.16		-	-0.10		0.61	-	
Wealth	0.11	-0.18		-0.08	-0.10		-	-0.22					0.09	0.16		0.07	0.08		-	0.08		-0.45	-	
GCI	-0.36	-0.35		0.02	0.09		-	-0.24					-0.33	-0.31		0.36	-0.15		-	-0.11		-0.16	-	
TAI	-0.45	-0.68		0.24	0.25		-	-0.57					-0.32	-0.36		0.32	-0.37		-	0.10		-0.61	-	
Quartile Analysis:																								
Districts by Size																								
Lowest Quartile	$45	$78	73.3%	$30	$49	63.3%	$0	$106	-				$540	$738	36.7%	$1	$89	6,242.7%	$0	$13	-	$27	$0	-100.0%
Second Quartile	$38	$61	60.5%	$32	$48	50.0%	$0	$79	-				$84	$118	40.5%	$3	$63	2,250.4%	$0	$8	-	$28	$0	-100.0%
Third Quartile	$36	$60	66.7%	$31	$49	58.1%	$0	$79	-				$0	$0	-	$2	$43	1,658.2%	$0	$8	-	$27	$0	-100.0%
Highest Quartile	$35	$53	51.4%	$22	$45	104.5%	$0	$49	-				$0	$0	-	$4	$19	431.6%	$0	$7	-	$25	$0	-100.0%
Districts by Need																								
Lowest Quartile	$37	$56	51.4%	$14	$21	50.0%	$0	$52	-				$84	$191	127.4%	$2	$24	1,444.3%	$0	$9	-	$21	$0	-100.0%
Second Quartile	$38	$61	60.5%	$20	$31	55.0%	$0	$62	-				$192	$205	6.8%	$4	$51	1,289.4%	$0	$13	-	$24	$0	-100.0%
Third Quartile	$37	$59	59.5%	$28	$45	60.7%	$0	$64	-				$81	$128	58.0%	$2	$59	2,796.6%	$0	$9	-	$28	$0	-100.0%
Highest Quartile	$41	$75	82.9%	$52	$94	80.8%	$0	$134	-				$270	$335	24.1%	$3	$81	2,776.2%	$0	$6	-	$33	$0	-100.0%
Districts by Wealth																								
Lowest Quartile	$39	$72	84.6%	$20	$41	105.0%	$0	$122	-				$106	$114	7.5%	$3	$73	2,519.9%	$0	$5	-	$32	$0	-100.0%
Second Quartile	$37	$55	48.6%	$30	$46	53.3%	$0	$64	-				$103	$56	-45.6%	$2	$25	1,536.3%	$0	$8	-	$28	$0	-100.0%
Third Quartile	$38	$67	76.3%	$46	$67	45.7%	$0	$76	-				$178	$309	73.6%	$3	$40	1,096.7%	$0	$13	-	$26	$0	-100.0%
Highest Quartile	$40	$57	42.5%	$20	$36	80.0%	$0	$50	-				$243	$388	59.7%	$2	$76	3,025.2%	$0	$10	-	$21	$0	-100.0%

* Miscellaneous Grants includes Child & Family Support Team Nurses and Social Workers, Learn and Earn, Assistant Principal Intern and MSA grants, Focused Education Reform Pilots, and School Technology Pilots.

** Other Regular Instruction includes Drivers Training, School Technology, Mentors, Staff Development, and Literacy Coaches

Source: All figures calculated by Augenblick, Palaich and Associates using data provided by the North Carolina Department of Public Instruction.

VIII. Resource Use in North Carolina School Districts

The purpose of this chapter is to summarize three different types of analyses that APA undertook in order to better understand how school districts in North Carolina use their education resources, with a specific focus on how resources are used to improve student performance. The three analytic approaches used were: (1) a statistical analysis of the relationships that exist between certain resources and student achievement in 2008-09; (2) an examination of how personnel usage is related to both student performance and district student-based need; and (3) interviews with school district personnel from districts around the state in an effort to understand educators' opinions about the types of resources that are associated with student performance and the role the allotment system plays in supporting district efforts to improve student performance. Combining the results of these approaches, we learned several things about the impact of resources on student performance which in turn has helped us think about the allotment system and ways it might be strengthened.

Statistical Analysis

Policymakers have had a longstanding interest in the statistical relationship between education resources and student performance. More than 40 years ago, an analysis of spending and performance essentially concluded that the relationship between per student spending and student performance was weak and that the strongest factors in predicting student performance were student demographic characteristics, particularly family income. A large number of studies have been undertaken since then, many of which were designed to deal with perceived shortcomings in the original work; with a few exceptions, more recent studies draw similar conclusions to those of the original study.

Our objective was to conduct a statistical analysis of the relationship between student performance and specific education resources, controlling for student demographic characteristics. We decided to use a statistical approach, linear regression. Three types of variables were used to predict the proportion of students in each school district in North Carolina in 2008-09 who were considered to be at least "proficient" (averaging the proportions for students in grades 3-8 and 10, for both mathematics and reading). The three types of variables (predictor variables) that were used included the following: (1) prior performance levels (from 2003-04); (2) student demographic characteristics (reflecting student needs for special services); and (3) several resource variables (such as numbers of personnel, salary levels, or spending for particular functions).

Recent analyses of this type have focused on predicting change in student performance and have become increasingly more sophisticated by examining change in the performance of individual students rather than change in the performance of groups of individuals (as in comparing the performance of particular grade levels, such as third grade, over time). Because this analysis was not the primary focus of our work, APA did not attempt to gather individual student data over time but, rather, used average performance for districts in one year. We examined the results of a number of regression equations, entering different combinations of predictor variables to improve the explanatory power and the

understandability of the resulting equations. Improvements in the equations were measured in the following ways:

- By explaining more of the variation in student performance (measured by a statistic referred to as the "r-squared," which means the proportion of the variation in performance across school districts that all of the variables in the regression, taken together, explain);

- By focusing on explanatory variables that were statistically significant at the five percent (.05) level (in order to be sure that if the regression were rerun in a slightly different way, there was a 95 percent chance that the variable would prove to be important); and

- By changing the format of some variables (such as adjusting salary levels by the geographic cost index [GCI] described earlier).

We used prior performance levels as a way to deal with change in performance over time, since assessments changed in North Carolina between 2003-04 and 2008-09, though we understand that the proportion of students identified as being proficient or better in 2003-04 cannot be directly compared to the proportion in 2008-09. The demographic characteristics we used included: (1) the proportion of students in special education programs; (2) the proportion of at-risk students; (3) the proportion of limited-English proficient (LEP) students; and (4) the proportion of academically/intellectually gifted students (AIG).

As shown in Table VIII-1, the base regression equation to explain student performance included prior performance; the proportion of students in three categories (at-risk, AIG, and LEP); the proportion of students in special education programs never proved to be significant in any of the regressions we ran, and ultimately, we excluded it as a good predictor variable. Taken together, these variables explained 84.5 percent of the variation in 2008-09 performance, much of that explanation related to prior performance, and with an expected negative influence of the proportions of at-risk and LEP students and a positive influence of AIG students (the strength of the influence of each variable is indicated by a beta coefficient or weight, a number that can be plus or minus and is always between zero and one in value).

We ran numerous regressions using the same variables as in the base regression and adding resource variables one at a time; most of these did not show that a specific variable was significant in explaining the variation in student performance. The remaining runs shown in Table VIII-1 (Alternative Regressions 1-5) illustrate the outcomes we obtained. For example, we found that we could increase the explanatory power of the regression (that is, the r-squared rose over the base regression) and reduce the strength of the "2003-04 performance" variable by including the numbers of teachers per 1,000 students in the regression, although the "number of teachers" variable was not statistically significant. This also proved to be the case for administration spending per student. The only variable that behaved in a similar fashion but was significant was the GCI-adjusted salary of teachers; that is, the average salary paid to teachers did help to explain the variation in student performance in a significant way beyond the amount explained by prior year performance or demographic variables.

Interestingly, neither the average years of teacher experience nor the proportion of teachers with more than a B.A. degree was statistically significant in explaining the variation in student performance although both factors contribute to the level of teacher salaries. Our conclusion is that districts pay more for teachers in order to obtain characteristics other than education and experience that they feel will contribute to improved student performance (see discussion below that summarizes the site visits).

Statistical Relationships between Personnel Usage and Student Performance

Despite the fact that statistical relationships between resources and student performance proved difficult to isolate, we wanted to see whether there were other ways to examine the relationships between resources, particularly the numbers of personnel districts employ, and district performance levels. We used data both from the North Carolina Department of Public Instruction (DPI) and the National Center for Education Statistics (NCES, which obtains its data from DPI). In order to compare districts, we standardized personnel data by calculating the number of personnel per 1,000 weighted students (we did this because districts of different size employ different numbers of people, making it impossible to compare personnel usage on the basis of raw personnel numbers and because districts with different student-based needs tend to employ different numbers of personnel – the weights reflect the relative cost of serving students with different needs based on figures APA has developed in other states). As we examined the figures, we were less interested in the actual values than we were in trends across districts grouped by level of performance (and, in some cases, by level of need).

The figures in Table VIII-2A, VIII-2B, and VIII-2C show average numbers of personnel per 1,000 weighted students for districts grouped into quartiles of student performance in 2008-09 (where performance is the proportion of students rated as proficient or higher as described above). In Tables VIII-2A and VIII-2B, figures are shown for two years (2003-04 and 2008-09) while figures in Table VIII-C are shown for one year. Three outcomes are possible when looking at the patterns of the figures across the four performance categories: (1) figures decline as performance increases, which suggests that fewer people are needed to produce higher results, thereby indicating personnel categories where districts could be more efficient; (2) figures increase as performance increases, which suggests that more people may be needed to produce higher results; and (3) figures show no pattern.

In Table VIII-2A, it is clear that districts that have higher levels of achievement also have higher numbers of staff; over time, the lowest performing districts have increased total staff more rapidly than the highest performing districts. The same pattern holds for teachers although, over time, the highest performing districts have continued to add teaching staff relative to enrollment while other districts have reduced the number of teachers they employ relative to students. As far as teaching assistants are concerned, districts with mid-level performance employ more assistants than either the highest or lowest performing districts; over time districts have been reducing the number of teaching assistants they employ relative to the number of students they serve.

The figures in Table VIII-2A also suggest that higher performing districts employ more district-level certified administrators and district office support staff than lower performing districts (it is important to note that a difference of .2 employees per 1,000 students represents one more employee in a 5,000

student district). A similar pattern is found for school-level administrators with the highest performing districts employing slightly more school administrators and even more school office support staff than lower performing districts, as shown in Table VIII-2B. Interestingly, in 2003-04, higher performing districts employed more library and media certified staff, more guidance staff, and more general support staff (people who work in the areas of plant maintenance and operations, such as custodians and plumbers, as well as food service workers, and transportation personnel). By 2008-09 there was little difference between districts in terms of library and media staff (higher performing districts had reduced the numbers of such employees), while there were more guidance staff and no pattern was evident for other support personnel.

Getting even more specific, as shown in Table VIII-2C, it appears that higher performing districts employee more technology specialists, similar numbers of health service workers, and fewer student mentors, teacher coaches, lead teachers, and social workers (for social workers, this was only true in the highest performing districts). We would be hesitant to conclude that fewer of these personnel are needed, however, since it is possible that lower performing districts have higher proportions of students with special needs and that districts employ more people to handle such needs; what is unclear is whether the presence of such people improves student performance.

In order to examine the interaction between student performance and student need in terms of personnel usage, we organized the data shown in Tables VIII-3A, VIII-3B, and VIII-3C. Districts are organized into quartiles of student-based need and then into three performance groups (high – more than one standard deviation above the average, moderate – being between one standard below the average and one standard above the average, and low – being below one standard deviation below the average) within each need quartile. In the case of the lowest need quartile, no districts performed at a low level while in the case of the highest need quartile, no districts performed at a high level.

Looking at Table VIII-3A, for total staff, in each of the need quartiles it is always true that high performing districts have more staff than low or moderate performing districts and that in two of three cases, moderate performing districts have more staff than low performing districts; therefore, even controlling for district need, higher performing districts employ more total staff than lower performing districts. This pattern is more pronounced for teachers. Of some concern is the fact that higher need districts employ fewer people, which raises an equity concern.

Higher performing districts with relatively high needs tend to employ more teaching assistants, which is not the case among districts with lower needs. Interestingly, higher performing districts in the lowest and highest need quartiles employ more district administrative staff (certificated and support) than lower performing districts – but that is not true among districts with mid-level needs.

Looking at Table VIII-3B, it appears that districts that perform at higher levels employ more school-level administrative support staff although they employ very slightly fewer school-level certified administrators (except among districts in the lowest need quartile, where higher performing districts do employ more school-level administrators). While we see no pattern for library/media certificated staff,

it appears as if higher performing districts employ more guidance staff than lower performing districts, regardless of district need. Curiously, higher performing districts with the highest needs employ fewer non-instructional support staff than lower performing districts with high needs while higher performing districts with the lowest needs employ more non-instructional support staff than lower performing districts with very low needs.

Finally, as shown in Table VIII-3C, higher performing districts employ equal numbers, or fewer, people in health services, as student mentors, as teacher coaches, as technology specialists, and as social workers than lower performing districts, regardless of district need. It would be inappropriate to conclude that such people are unimportant simply because they appear to be unrelated in a direct way to student performance – they may not have been employed long enough to have a measurable impact on performance or they may serve another purpose that is separate from student achievement. Higher performing districts among districts with relatively high needs (in the middle-high and highest quartiles of need) employ more lead teachers than lower performing districts with similar needs.

Interviews with School District Personnel

Interviews were conducted with school district administrators in 11 districts across North Carolina to obtain further information about the perceived effectiveness of different kinds of resources in promoting improved student performance and to better understand how the allotment system impacts student achievement. The goal was to identify and interview districts that realized above predicted performance in 2008-09. A composite score was used to represent performance. The composite score was derived based on the combined percentage of students performing at or above proficient on the 3rd, 8th and 10th grade End of Grade assessments for math and reading.

In addition to analyzing the student performance we analyzed district demographic factors that might have a significant impact on performance and spending including at risk and free/reduced lunch participation rates. Finally, the district's location was considered in order to ensure representation from districts in different regions.

Please note that the data available did not provide for the rigorous statistical analysis of performance over time required to judge individual or comparative district performance. Instead, our analysis generated what we believe is a representative sampling of relatively higher performing districts. Our data analysis, when combined with the number of interviews across districts in diverse locations with different demographics, provides what we believe to be a qualified number of districts to interview for insights into the current funding allotment system.

We identified 14 districts from which we were able to schedule 11 in-person district interview sessions over a three-week period in August of 2010. The 14 districts identified are listed as follows (with the 11 districts interviewed in **bold**): Alexander County, **Asheville City, Burke County**, Carteret County, **Cleveland County, Craven County, Haywood County, Henderson County, Mount Airy City, Newton-Conover City, Pender County**, Surry County, **Transylvania County, and Whiteville City.**

In addition to being identified as possibly higher-performing based on our analysis, these districts also had the following characteristics based on 2008-09 data:

- Geographic diversity – 4 districts from eastern region, 3 from central region, 7 from western region
- Percentages of students identified as at-risk ranging from approximately 13% to 28%.
- Student enrollment (as defined by ADM) ranging from 2,167 to 20,586.

An interview protocol was created to qualitatively explore how districts are using resources to improve student achievement and capture recommendations for improvements in the state education funding system. Interview questions were focused on the approach to funding education in North Carolina as opposed to the adequacy or equity of funding. Each interview was conducted by two consultants in person at the districts. The superintendent, academic leadership and financial leadership were generally all present at the interview sessions. Those interviewed were told that there would be no personal attribution of comments in order to enable greater openness.

In general, the responses were consistent with the information collected by APA in its preliminary interviews with key stakeholders. The districts interviewed are generally content with the current method of state funding allotments. They overwhelmingly appreciate the allotment of teaching positions because it allows them to allocate the highest paid positions to the state fund. Some also indicated that the position allotment allowed them to focus on teacher quality instead of salary and that the approach improved equity.

With regard to how districts used funding on critical investments to improve student achievement, the majority of feedback related to these general categories:

- Teachers, classroom, and school organization.
- Professional development and instructional coaches.
- Assessments and data.
- Leadership, administration, planning and management.
- Technology.

Additional areas that were referenced by some interview participants as having a positive impact on student achievement included: 1) Response to Intervention (R-t-I) programs; 2) more personalized learning and personal education plans; 3) extended day programs for students; 4) programs to engage parents and communities in schools; 5) alternative education programs; 6) early college programs; 7) virtual education programs; and 8) pre-school.

Teachers and school organization

With regard to investments in teachers, classroom, and school organization, the trend in comments from the interviews was that district leaders recognized that having quality teachers in the classroom was of paramount importance to generating high student performance. District leaders emphasized the importance of using resources to hire additional teachers, to maintain teacher staffing in the face of

budget cuts, and to provide support staff such as counselors, social workers, technology facilitators, and assistant principals that help make teachers more effective in their jobs.

Professional Development

Interview responses on the importance of professional development and coaching tied in directly with the emphasis district leaders place on teacher quality. In fact, leaders find staff development in subject area content and instructional practice is critical to success. Some districts indicate that professional development and programs in literacy, classroom and behavior management can also reduce numbers of students placed in special education programs. Two other important themes that emerged across the interviews include:

1) Concern that the state no longer has a funding allotment for professional development (although state aid from other allotments can be used for professional development). In fact, several district leaders have had to find other sources to continue funding support for professional development; and
2) The use of instructional coaches to support teachers and to provide a constant review of best practices and modeling of effective teaching. Districts utilized funding from other sources, such as federal Title I and II to fund placement of such coaches in schools at all grade levels. Such use of one-on-one coaching provided directly to teachers in their own schools was viewed as a highly effective way to provide meaningful, hands-on professional development.

Assessments

Districts indicated an emphasis on assessment and use of data as an important contributor to academic success. Districts use combinations of weekly and quarterly assessments to track student progress, develop personalized education plans for underperforming students, and to help students track their own progress. Some districts craft their own assessments using coaches to help develop and revise the tests as needed.

Leadership, Administration, Planning and Management

Interview feedback indicated districts place a priority on supporting school principals to become effective leaders. This means helping principals not just as building administrators but as instructional leaders as well. This means help ensuring principals are in the classroom monitoring, observing and supporting teachers. It can also mean developing tightly aligned district and school level performance goals and plans. Interviews also pointed to a variety of strategies used to streamline district administrative costs and spending in order to more efficiently deploy resources at the school level. Examples of such strategies include leveraging group purchases among schools, maintaining a lean central office staff, and an energy management program to reduce annual energy expenses.

Technology

District leaders placed a high value on investments in technology both for students and staff members. Some districts interviewed have identified their own, specific revenue sources to help support enhanced technology investments. These are used for a variety of initiatives, from assessing staff technology competencies, to offering targeted training, to providing instructional technology, and other technology to stimulate and enhance student learning.

TABLE VIII-1
RESULTS (R-SQUARE AND BETAS) OF ALTERNATIVE REGRESSIONS USING A VARIETY OF VARIABLES TO EXPLAIN THE VARIATION IN 2008-09 STUDENT PERFORMANCE AMONG NORTH CAROLINA SCHOOL DISTRICTS

	Alternative Regressions					
	Base	1	2	3	4	5
Characteristics of Regressions						
R-Square	*0.845*	*0.848*	*0.851*	*0.848*	*0.846*	*0.847*
Prior Performance						
2003-04 Performance	0.737	0.722	0.699	0.731	0.715	0.724
Student Demographics						
At-Risk	-0.218	-0.251	-0.271	-0.232	-0.214	-0.252
AIG	0.069	0.059	0.071	0.069	0.059	0.066
LEP	-0.080	-0.077	-0.052	-0.066	-0.080	-0.075
Resources						
Teachers /1,000 Students		0.061				
GCI-Adjusted Salary			0.095			
Average Years of Experience				0.042		
Proportion of Teachers with More than a B.A. Degree					0.048	
Adminstration Spending per Student						0.055

Note: gray = not significant

TABLE VIII-2A

AVERAGE NUMBER OF EMPLOYEES OF NORTH CAROLINA SCHOOL DISTRICTS, BY TYPE, PER 1,000 WEIGHTED STUDENTS* IN 2003-04 AND IN 2008-09 FOR DISTRICTS GROUPED BY QUARTILES OF 2008-09 STUDENT PERFORMANCE

	Type of Employee														
				Teachers and Teacher Assistants						Central Office Administration					
	Total Staff			FTE Teachers			Teacher Assistants			District Administration (Certified)			Central District Office Support		
Performance Quartile	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change
Lowest	93.9	101.1	7.7%	48.3	47.7	-1.2%	15.7	15.4	-1.9%	1.6	1.4	-17.0%	1.9	3.1	63.6%
Middle Low	96.8	101.3	4.6%	49.6	49.1	-0.9%	17.2	15.9	-7.1%	1.4	1.4	0.3%	1.9	2.8	52.1%
Middle High	99.1	107.1	8.1%	51.9	51.2	-1.5%	16.8	16.4	-2.1%	1.6	1.6	-1.4%	2.0	3.0	49.9%
Highest	101.8	107.5	5.6%	53.0	53.1	0.1%	16.6	15.8	-4.9%	1.8	1.6	-9.6%	2.1	3.3	56.3%
Simple District Average**	97.9	104.2	6.4%	50.7	50.2	-1.0%	16.6	15.9	-4.0%	1.6	1.5	-7.3%	2.0	3.0	55.5%

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in special education programs, 1.10; English-language learners, 0.
and students eligible for free/reduced-price lunch, 0.40.

** The simple district average is the average of the values (not percdentages) for the 115 school districts.

Source: National Center for Education Statistics (NCES)

TABLE VIII-2B

AVERAGE NUMBER OF EMPLOYEES OF NORTH CAROLINA SCHOOL DISTRICTS, BY TYPE, PER 1,000 WEIGHTED STUDENTS* IN 2003-04 AND IN 2008-09 FOR DISTRICTS GROUPED BY QUARTILES OF 2008-09 STUDENT PERFORMANCE

	Type of Employee														
	School-Level Administration												Other Support (Plant M&O, Food Service, and Transportation)		
	School Administration (Certified)			School Office Support			Library and Media (Certified)			Guidance					
Performance Quartile	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change	2003-04	2008-09	Change
Lowest	2.6	2.7	5.6%	3.7	3.7	-0.4%	1.3	1.3	-6.1%	1.8	1.9	8.2%	14.8	17.1	15.4%
Middle Low	2.7	2.6	-0.6%	3.6	3.6	-0.2%	1.3	1.3	-0.7%	1.8	2.0	12.6%	15.0	16.4	9.2%
Middle High	2.8	2.7	-2.8%	3.9	4.0	4.0%	1.5	1.4	-8.0%	2.0	2.0	2.6%	15.1	18.3	20.8%
Highest	2.8	2.8	1.0%	4.1	4.1	0.7%	1.6	1.3	-18.5%	2.0	2.1	9.4%	15.5	16.9	9.0%
Simple District Average**	2.7	2.7	0.7%	3.8	3.8	1.0%	1.4	1.3	-8.7%	1.9	2.0	8.1%	15.1	17.2	13.5%

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in special education programs, 1.10; English-language learners, 0.90; and students eligible for free/reduced-price lunch, 0.40.

** The simple district average is the average of the values (not percdentages) for the 115 school districts.

Source: National Center for Education Statistics (NCES)

TABLE VIII-2C

AVERAGE NUMBER OF EMPLOYEES OF NORTH CAROLINA SCHOOL DISTRICTS, BY TYPE, PER 1,000 WEIGHTED STUDENTS* IN 2008-09 FOR DISTRICTS GROUPED BY QUARTILES OF 2008-09 STUDENT PERFORMANCE

	Type of Employee					
Performance Quartile	Health Services	Student Mentors	Teacher Coaches	Technology Specialists	Lead Teachers	Social Workers
Lowest	0.60	0.06	0.41	0.03	0.12	0.65
Middle Low	0.47	0.03	0.39	0.07	0.10	0.53
Middle High	0.58	0.05	0.28	0.10	0.08	0.62
Highest	0.59	0.02	0.30	0.09	0.08	0.33
Simple District Average**	0.56	0.04	0.35	0.07	0.09	0.53

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in spe programs, 1.10; English-language learners, 0.90; and students eligible for free/reduced-price lunch, 0.40.

** The simple district average is the average of the values (not percentages) for the 115 school districts.

Source: North Carolina Department of Public Instruction

TABLE VIII-3A

AVERAGE NUMBER OF EMPLOYEES OF NORTH CAROLINA SCHOOL DISTRICTS, BY TYPE, PER 1,000 WEIGHTED STUDENTS* IN 2008-09 ORGANIZED INTO GROUPS BASED ON BOTH QUARTILES OF RELATIVE NEED (RATIO OF WEIGHTED TO UNWEIGHTED STUDENTS) AND 2008-09 STUDENT PERFORMANCE (BY LEVEL: LOW, MODERATE, OR HIGH)**

Group Characteristics		Type of Employee				
			Teachers and Teaching Assistants		District-Level Administration	
Need Quartile	Performance Group	Total Staff	FTE Teachers	Teaching Assistants	District-Level Certified Administrators	District Administrative Support Staff
Lowest						
	Moderate	105.8	50.8	16.6	1.7	3.1
	High	114.0	56.3	16.4	2.1	3.4
Middle Low						
	Low	102.1	47.5	13.7	1.5	4.0
	Moderate	102.9	50.2	15.5	1.2	2.6
	High	104.5	52.6	15.1	1.4	3.5
Middle High						
	Low	104.1	46.9	16.9	1.3	3.1
	Moderate	103.2	50.5	15.6	1.4	2.9
	High	112.7	53.4	17.5	1.3	3.1
Highest						
	Low	100.4	47.9	14.5	1.4	3.0
	Moderate	102.7	48.8	16.7	1.6	3.2

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in special education programs, 1.10; English-language learners, 0.90; and students eligible for free/reduced-price lunch, 0.40.

** Student performance is based on the following performance scores: low, less than 64 percent proficient; moderate, between 64 and 81 percent proficient; and high, over 81 percent proficient.

Source: National Center for Education Statistics (NCES)

TABLE VIII-3B

AVERAGE NUMBER OF EMPLOYEES, BY TYPE, PER 1,000 WEIGHTED STUDENTS* OF NORTH CAROLINA SCHOOL DISTRICTS IN 2008-09 ORGANIZED INTO GROUPS BASED ON BOTH QUARTILES OF RELATIVE NEED (RATIO OF WEIGHTED TO UNWEIGHTED STUDENTS) AND 2008-09 STUDENT PERFORMANCE (BY LEVEL: LOW, MODERATE, OR HIGH)**

Group Characteristics		Type of Employee				
		School-Level Administration				
Need Quartile	Performance Group	School-Level Certified Administrators	School-Level Administrative Support Staff	Library/Media Certified Staff	Guidance	Other Support Staff (Facilities M&O, Transporation, Food Services, etc.)
Lowest						
	Moderate	2.6	3.8	1.3	2.0	17.5
	High	3.2	4.5	1.3	2.2	18.4
Middle Low						
	Low	2.7	3.8	1.4	2.0	18.8
	Moderate	2.7	3.9	1.3	2.0	17.2
	High	2.6	3.3	1.4	2.2	16.7
Middle High						
	Low	3.0	3.5	1.4	2.3	18.7
	Moderate	2.7	3.8	1.3	2.0	17.0
	High	2.9	4.4	1.3	2.2	18.9
Highest						
	Low	2.8	3.7	1.1	1.9	16.9
	Moderate	2.7	3.8	1.3	2.1	15.6

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in special education programs, 1.10; English-language learners, 0.90; and students eligible for free/reduced-price lunch, 0.40.

** Student performance is based on the following performance scores: low, less than 64 percent proficient; moderate, between 64 and 81 percent proficient; and high, over 81 percent proficient.

Source: National Center for Education Statistics (NCES)

TABLE VIII-3C

AVERAGE NUMBER OF EMPLOYEES , BY TYPE, PER 1,000 WEIGHTED STUDENTS* OF NORTH CAROLINA SCHOOL DISTRICTS IN 2008-09 ORGANIZED INTO GROUPS BASED ON BOTH QUARTILES OF RELATIVE NEED (RATIO OF WEIGHTED TO UNWEIGHTED STUDENTS) AND 2008-09 STUDENT PERFORMANCE lOW, MODERATE, AND HIGH)**

Group Characteristics		Type of Employee					
Need Quartile	Performance Group	Health Services	Student Mentors	Teacher Coaches	Technology Specialists	Lead Teachers	Social Workers
Lowest							
	Moderate	0.7	0.0	0.4	0.1	0.0	0.5
	High	0.7	0.0	0.3	0.0	0.0	0.3
Middle Low							
	Low	0.5	0.0	0.4	0.1	0.2	0.8
	Moderate	0.5	0.0	0.2	0.0	0.1	0.5
	High	0.5	0.0	0.0	0.0	0.0	0.2
Middle High							
	Low	0.8	0.0	0.4	0.0	0.1	0.9
	Moderate	0.5	0.0	0.3	1.0	0.1	0.6
	High	0.5	0.0	0.3	0.0	0.5	0.5
Highest							
	Low	0.7	0.2	0.5	0.0	0.1	0.6
	Moderate	0.4	0.1	0.4	0.0	0.2	0.5

* Students are weighted as follows based on the relative excess cost of serving them appropriately: students in specia education programs, 1.10; English-language learners, 0.90; and students eligible for free/reduced-price lunch, 0.40.

** Student performance is based on the following performance scores: low, less than 64 percent proficient; moderate, between 64 and 81 percent proficient; and high, over 81 percent proficient.

Source: North Carolina Department of Public Instruction

IX. School Finance Approaches Other States Use to Accomplish Key North Carolina Objectives

The purpose of this chapter is to compare key components of the North Carolina allotment system to those that other states use to allocate state aid to school districts. We chose to focus on the largest allotments and ones that use complex formulas as the basis of calculating state support in North Carolina, including the following structural characteristics:

1. Determining the number of teachers the state will support;
2. Setting teacher salaries;
3. Recognizing the added costs of serving students with special needs;
4. Recognizing the cost pressures associated with district size and geographic price differences; and
5. Making state aid sensitive to the wealth of school districts.

We focused our attention on states that are members of the Southern Regional Education Board (SREB) because our experience is that states in the Southeast, like North Carolina, tend to be more interested in peer states. However, we also looked at states outside of the SREB region if we felt that it might illustrate an interesting approach. Before examining specific approaches, we thought it would be useful to review the development of school finance systems in the United States over time so as to provide a context in which to place the structures that states use today.

A Brief History of the Development of School Finance Systems in the United States

The first public schools in the American colonies grew out of a requirement that towns of a certain size provide education services to young students. The expansion of such schools took place when towns were given the authority to levy property taxes to support them. It was not until the last half of the 19th Century that states began to provide support for public education, which was prompted by a concern that the quality of schools varied across communities in terms of how long they operated, whether staff were qualified, and the availability of supplies and materials. Initially, the role of state support was to assure that all schools met a set of minimum standards, with localities able to supplement state aid to whatever extent they wanted.

In the early part of the 20th Century, states became aware of the vast differences that existed in the quality of schools across the hundreds, if not thousands, of communities that oversaw the public schools in each state, much of which could be attributed to the widely varying wealth of those communities (driven by the value of taxable property). Some states began to develop mechanisms designed to "equalize" the distribution of state support so that less wealthy communities received more state support than relatively wealthy communities – this was done under the following circumstances: (1) school districts, typically organized below the county level of government, governed public schools; (2) school districts had the authority to levy property taxes to support public schools; and (3) a combination

of state and local revenue was needed to assure that education was provided in an appropriate manner (in other states, many in the southern region of the country, schools were governed at the county level and the state took on the obligation to assure that an appropriate level of service could be provided without relying on county support).

The primary mechanism developed by many states to promote such equalization was the "foundation program." The basic concept of a foundation program is that the state determines the revenue needs of each school district (which could be as simple as specifying an amount of revenue per student) and pays as state aid the difference between that amount of revenue and the amount generated locally by a uniform property tax rate. Under a foundation program, two districts could have the same revenue needs but receive different amounts of state support because the wealthier of the two districts could generate more local revenue at the uniform tax rate than the less wealthy of the two districts.

Almost every state in the nation uses some version of the foundation program today although both the approaches used to determine the revenue needs of each school district and the calculation of the revenue expected to be raised by each district differ from state to state. Only a few states, including North Carolina and Hawaii, do not require that any local contribution be made to support public schools.

Over the past 40 years or so, the states have dramatically changed the ways they estimate the revenue needs of individual school districts. Moving away from using a fixed amount per student, states have developed a variety of ways to take into consideration the varying costs different districts face due to circumstances beyond their control, including those associated with student characteristics and those associated with district characteristics. States have recognized that the costs of providing special education services, serving students who are at risk of failing in school, students with English-language difficulties, gifted students, or students in vocational or career-technical education programs differ from the costs of serving students with no special needs and that the proportions of students with special needs vary across school districts, which has a differential cost impact. States have also recognized that costs differ in districts of different size, in districts with different patterns of enrollment change over time, and in districts located in different regions of a state. The mechanisms the states have developed to recognize the impact of these cost factors differ from state to state. No single state considers all of the factors that are taken into consideration collectively by the states.

In order to implement the foundation approach, the states have had to address a variety of interesting policy issues. For example, some states require that the local contribution be made while others calculate state aid based on the expectation that the contribution will be made (even if it is not made). Most states allow very wealthy districts to reduce expected tax effort if the amount raised locally at that effort would exceed the state's calculation of a district's revenue needs (although a couple of states "recapture" the excess local revenue for redistribution to other, less wealthy, districts). Most states provide some level of state aid to even the wealthiest districts even when they would not be eligible for such support based on the foundation program's calculations. Since the late 1970s, as tax limitations have constrained local revenue, state aid as a proportion of all the state and local revenue governed by a foundation program has risen.

An alternative to the foundation approach became attractive in the 1970s and 1980s. This approach, based on state aid being tied to local tax effort, was designed to both equalize state aid with regard to district wealth and be sensitive to school district tax effort. These "matching programs" allowed districts to determine their own revenue needs (thereby avoiding the state determining revenue needs) and provided an incentive for districts to raise local tax rates since state aid would increase with tax effort. Today, only a couple of states use this approach but a few others use it to supplement their foundation programs (supplemental programs are sometimes referred to as "second tiers").

The discussion above primarily relates to state support for school district current operations (that is, expenditures consumed in one school year, such as teacher salaries, electricity, or paper). Initially, few states provided any support for capital purposes (to build facilities expected to last 20-30 years) under the theory that buildings were owned by school districts and the responsibility of maintaining them was local. However, over time some states began to provide predictable amounts, either as a flat amount per student or as a percentage of eligible expenditures, in order to assure that appropriate facilities were in place. Later, some states provided wealth-equalized support in order to promote greater equity in facilities across school districts. A few states have attempted to pay for all capital expenditures in order to promote greater efficiency, by controlling the design of buildings and using the fiscal power of a state to keep interest costs low.

Determining Number of Teachers the State Will Support

While many states base their allocations of aid to school districts on the basis of a fixed dollar amount per student (which may be adjusted by factors that ultimately result in a different per student amount for every district) there are other states that use a position allotment system as the primary basis of allocating aid. For example, Alabama, Georgia, and West Virginia use personnel allotment systems based on ratios of personnel, by type, to students. Like North Carolina, the systems in Alabama and Georgia use different personnel ratios for different grade spans, such as one ratio for early elementary education grades (K-3), another for later elementary grades (4-5), one for middle school grades and another for high school, though the specific grade spans differ slightly from those used in North Carolina. In West Virginia, the personnel ratios are adjusted by district density as a way to address economies of scale (rather than having a separate allotment for small counties). These other states have personnel ratios for teachers, instructional support staff (which may be differentiated for librarians, counselors, and nurses), clerical staff, school administrators and district administrators. In West Virginia, the personnel ratios include minimum levels that must be met or state aid is reduced.

Setting Teacher Salaries

Other states also use statewide salary schedules like North Carolina, or have specific requirements around how district salary schedules are set. These salary schedules may differentiate salaries on the basis of experience and education (as is done in North Carolina) or they may be based upon other factors, such as professional development and performance.

For example, Georgia uses a statewide salary schedule based on years of experience and education level but also provides bonus payments or salary increases for teachers who meet any of several different criteria: (1) being certified by the National Board for Professional Teaching Standards and working in a high need school; (2) teaching a hard-to-staff subject area and working in an area of the state with teacher shortages; and (3) secondary teachers who earn mathematics or science certification.

In Florida, instead of having a statewide salary schedule the state mandates that districts have their own salary schedules that: (1) provide incentives for professional development other than earned graduate credits; (2) require that a portion of pay be based on an evaluation, which must reflect student performance; and (3) differentiate pay on the basis of critical shortages for particular teaching specialties, high-need schools, and added responsibilities (such as working as a teacher mentor). The state also operates a merit award program that allocates bonuses to teachers of between five and 10 percent of salary based on a combination of student performance and teacher evaluation.

Texas also does not have a statewide salary schedule but does set minimum salaries for teachers and other certified support staff based on years of experience (education level is not considered). In Texas, teachers certified as master teachers in reading, mathematics, science, or technology and who work in high need schools receive an annual bonus.

Other states use different approaches to recognize teacher salary costs, even when they do not set a statewide salary schedule or requirements for district salary schedules. For example, Minnesota uses an "experience and education attainment" factor designed to provide more support to districts in which the education and experience of teachers is relatively high. Minnesota also has a system (Q-Comp) that provides additional revenue to districts that adopt an alternative teacher compensation plan approved by the state, which must include career ladders for teachers, job-embedded professional development, instructional observation and standards-based assessments, measures of student academic growth , and performance pay (with at least 60 percent of any salary increase based on teacher performance). New Mexico also does not have a statewide salary schedule but does set minimum salary levels tied to its three-tiered teacher licensure system (Levels One, Two and Three). Like Minnesota, New Mexico also recognizes differences in teacher education and experience through a factor that weights those elements for teachers, instructional support staff, and administrators.

Recognizing the Added Costs of Serving Students with Special Needs

The most common procedure for providing state aid for students with special needs is the use of student "weights." Such weights are factors that reflect the relative cost of serving students with special needs, such as students enrolled in special education programs, those considered to be at-risk of failing or limited-English proficient students.

Special Education Students

A number of states use a "census-based" approach to providing support for special education. Under this approach, every district is assumed to have the same proportion of students in special education

and a single weight is then used to reflect the relative cost of serving such students.[10] North Carolina's system is not census-based since funds are allotted on the basis of the actual numbers of students enrolled in special education programs. However, North Carolina has set a limit of how many students, as a proportion of the total population can be funded, and it then provides a single dollar amount per student. In other states, policymakers are unwilling to make the assumption required by the census-based approach and, typically, create multiple weights that are designed to reflect two aspects of special education costs: (1) students with different disabilities, requiring different kinds of services, have different costs; and (2) the proportion of students with different disabilities varies across school districts.

States that primarily use weights differ in terms of how many weights they use. For example, in Kentucky three weights are used (associated with the incidence of groups of disabilities), in Georgia six weights are used (based on student disabilities and type of service provided), and in South Carolina, 10 weights are used (related to disability).

At-Risk Students

States also use weights to distribute state aid for at-risk students. Other than the magnitude of the weight, the states differ on how students are counted as the basis of distributing funds. Most states use a "proxy" measure to count at-risk students – such as eligibility for free and reduced-price lunch. The proxy is used in order to avoid providing incentives for districts to perform poorly in order to obtain more state aid. States tend to use proxies that change annually rather than using more precise measures, such as those available through the Census, that only change occasionally.

Texas is one example of a state that uses a weight for all students eligible for free and reduced-price lunch, although they have another weight specifically for full-time pregnant students. Interestingly, Georgia does not use a proxy for at-risk students but, rather, allocates funds based on the number of students in remedial programs and early intervention programs. Florida, which has numerous student weights, does not use one for at-risk students; instead, the state allocates a fixed amount per student (for all students) under what appears to be a "census-based" rationale that all districts have about the same proportion of students who need added support in order to be academically successful.

Limited English Proficiency (LEP) Students

Weights are also used by states for LEP students although there may be restrictions on applying the weight, such as a limit on the number of years a student is eligible to participate in a special program for English-language learners. Both Georgia and Florida use weights based on the number of students in English to Speakers of Other Languages (ESOL) programs.

[10] This single weight, multiplied by the assumed proportion, is multiplied by a base cost figure – a dollar amount per student – to determine total need; since these programs may operate within foundation-type programs, the state only pays a share of the cost of special education, which depends on the relative wealth of school districts.

One issue that does arise in using student weights is whether students can earn multiple weights because they have multiple characteristics (for example, a student in special education may also be eligible for free lunch). Letting students earn multiple weights is often allowed because the funds are not required to be used precisely for those students that "earned" them. Also as far as we know, most states allow districts to earn extra funding based on every characteristic that is weighted because their student data systems do not track weights. In Maryland, however, student weights are tracked by individual student and students earn only the highest weight for which they are individually eligible.

Recognizing the Cost Pressures Associated with District Size and Geographic Price Differences

Some states recognize that school districts face cost pressures associated with district-based characteristics, in addition to student-based characteristics discussed in the previous section. The primary cost pressures addressed by states that are district specific are those related to size and location (geographic price differences), though many states do not deal with either of these. Addressing issues with district size is primarily a western issue, where school districts are widely dispersed and population density is very low in large areas of states, such as Colorado, Kansas, and Montana, and regional price differences tend to be dealt with in states with large urban centers, such as Texas or New York.

While many states provide additional funding of varying amounts to small districts, we are not concerned with the amount of additional funding provided, but instead are interested in the enrollment points at which additional funding is triggered. In North Carolina, additional funding is given when districts have fewer than about 3,200 students while other funding is added, based on size and wealth, for districts between about 3,200 and about 4,100 students. In Texas, additional funding is available to districts with fewer than 1,600 students (based on population density) and districts with fewer than 130 students receive an even higher level of additional funding. In West Virginia, added funding is available to districts with fewer than 1,400 students (also based on density).

North Carolina does not currently have an allotment that is designed to recognize geographic price differences, though we have discussed such a factor in other chapters of this report and such a factor is used in other states in the SREB region. In Florida, a Price Level Index is used to reflect cost-of-living differences between districts; this index is designed to reflect the adjustment that would have to be made to educators' salaries in order to maintain a particular standard of living throughout the state. In Texas, an index is also used to reflect wage differences across school districts that are caused by factors beyond the control of school districts, including district size.

Making State Aid Sensitive to the Wealth of School Districts

As we have noted before, because North Carolina does not expect that school districts will make a local contribution to support elementary and secondary education, it does not differentiate its support based on the wealth of school districts – although it does provide some supplemental funding that takes wealth, and/or tax effort, into consideration. While most of North Carolina's allotments distribute aid in a way that is neutral as far as wealth is concerned, our examination of the system suggests that local support is considered to be essential by many people and that the overall equity of the system is

reduced when local support is taken into consideration (even if school finance litigation in North Carolina finds that the system meets constitutional expectations without considering local funds). Therefore, it makes sense to present some information about how other states deal with the variation in wealth and tax effort across school districts.

As we have discussed earlier, most states differentiate their support of school districts based on the relative wealth of the districts by using a basic structure, such as a foundation program, that incorporates all, then adjusting that entire amount by wealth. In some cases, certain spending components, such as transportation or special education, are excluded from the foundation program and, therefore, are not wealth equalized.

For example, Kentucky has used a foundation program since 1990. Under this approach, the state assures that every district can generate a specified amount of revenue per student, which is adjusted across districts for several factors associated with the cost pressures they face. Each district is required to make the equivalent of a $.30 per $100 of assessed property value in tax effort (revenue can come from local taxes other than property taxes); state aid is the difference between the amount of revenue the state assures and the revenue generated by the required tax effort. This system results in more state aid being allocated to less wealthy districts (since they do not raise as much revenue as wealthier districts at the same tax effort). States differ in how they determine the guaranteed level of revenue, with some using relatively simple approaches and others using far more complex approaches, including ones based on student-teacher ratios and statewide salary schedules (such as Delaware).

In some states, unequalized aid is provided in addition to the support allotted through the foundation program, which may be to promote certain programs or services that the states feel should not be wealth equalized. A few states use a supplementary program to equalize the ability of districts to provide local funds beyond those required (or expected) under the foundation program; these approaches, sometimes referred to as “second tiers,” provide an incentive for districts to contribute local revenue and do so in such a way that the amount of per student revenue generated per unit of tax effort (such as a penny per hundred dollars of assessed property valuation) is similar across most districts. This kind of approach is referred to as “power equalization” and is accomplished through formulas that provide matching state aid for local support, inversely related to wealth.

For example, in Georgia, the state will provide matching aid for every mill (a tenth of a penny) of tax effort a district makes above the five mills required in the foundation program, with the match designed to guarantee that all districts will obtain as much revenue per student as the district at the 90th percentile of all districts in terms of wealth (a district with higher wealth would receive no state aid). Maryland has a second tier that operates in a similar fashion except that the matching target is the district at the 80th percentile of all districts and there is a limit on the tax rate for which a match will be provided (defined as 20 percent of foundation program revenues in each district).

X. Strengths and Weaknesses of North Carolina's Allotment System and Alternative Approaches to Strengthen the Allotment System

Having examined North Carolina's school allotment system from a number of perspectives, APA concluded that the system has a variety of strengths and weaknesses that it could be modified in a variety of ways to improve the equity and efficiency with which state aid is distributed. The purpose of this final section of the report is to briefly summarize the strengths and weaknesses of the allotment system and to propose a variety of ways in which components of the system could be changed. We present here a set of alternatives that can be considered independent of each other, although more than one alternative could be implemented in conjunction with others.

It is worth reminding readers of this report that our task was to evaluate the structure of the system, not the amounts of revenue generated by the system of allotments or by any single allotment. That is, we were concerned about the procedures used to allocate state aid, *not* the parameters used to determine *how much* aid was distributed. In school finance, it is often the case that a state aid allocation system can be structurally sound but still distribute too little state revenue, resulting in a greater reliance on local funds that undermines the integrity of the entire system. As we have discussed earlier, North Carolina is a special case among the states, although not unique, because no local revenue is required and litigation has found state aid to be sufficient to meet constitutional expectations (although it is also true that certain allotment procedures take local funds into consideration and litigation predates the most recent reductions in state support). The changes in the structure of the allotment system that we suggest be examined can be made in a "fiscally neutral" manner. That is, none of the changes requires that the state provide more revenue in order to be implemented although there may be situations where more state support would significantly improve the way an allotment operates.

Structural Strengths of the Allotment System

North Carolina's allotment system for schools has evolved over a long time, adding components onto (and, in some cases, later removing components) the largest, and most basic, component of the entire system – the provision of teachers in every school district. Perhaps the greatest strength of the system is that, taken together, the allotments address almost all of the cost factors associated with providing education services. These include ones associated with critical resources (such as teachers), ones associated with students who have special needs (such as those enrolled in special education programs), and ones associated with district-based uncontrollable cost factors (such as size). Our conclusion is that the state has paid a great deal of attention to what other states have been doing in the past 40 years to recognize the cost pressures that school districts face in providing education services. North Carolina has incorporated almost all of the factors that other states have identified and has developed allotments to address almost every one (one exception is the uncontrollable pressure associated with regional price differences that only a few states have built into their school finance systems).

In our view, the other critical strength of the allotment system is that it distributes state aid in a highly equitable manner, where equity is achieved primarily by reducing the variation in state aid across districts. At the same time, equity reflects the fact that, taken together, state aid is inversely related to district size (smaller districts receive more state aid per student than large ones in recognition of the higher costs per student smaller districts have), is positively related to aggregate district student-based need, and is neutral with regard to district wealth. In other states, where local revenues are required to be provided (or at least expected to be provided), equity of state aid, in and of itself, would not be considered a positive attribute since aid would need to vary considerably across districts in order to equalize the impact of district wealth.

We also view it as a strength that many of North Carolina's allotments use simple, easily understood allocation procedures. Some of the procedures provide a fixed amount of money for each student, or subgroup of students, that is simple to estimate and relatively easy to project into the future (provided the allotment is maintained). Such approaches assure a minimum level of variation across districts while being sensitive to the student-based needs of districts, thereby contributing to the overall equity of state aid.

Another important strength of the system – one that has expanded dramatically in the last few years – is the flexibility it promotes in the use of funds. That flexibility is consistent with "standards-based reform," the approach that many states have embraced in the last 15 years that has focused attention on student achievement and school district accountability for meeting state-determined student performance expectations while diminishing state control over how education revenues are spent despite states' providing the majority of education funding support. While we are not confident that every school district is either aware of how much flexibility they have in spending state aid or is prepared to take advantage of that flexibility, state aid has become much more fungible, placing the onus on districts to make decisions about how best to organize education resources (and, in the short term, make changes as a result of reduced state support).

Finally, the strength of the state's largest allotment, which supports an equitable distribution of teachers, allows districts to select people whose education level and experience are consistent, to a large extent, with districts' beliefs about the importance of those characteristics in providing education services. Only a handful of states support school districts in this way, neutralizing the cost impact of the primary factors used to determine teachers' salaries, which is the largest single driver of spending differences across districts.

Structural Weaknesses of the Allotment System

As strong as the allotment system is, we found that it suffers from a variety of weaknesses that undermine its ability to fully accomplish the objectives of allocating funds in an equitable and efficient manner. Perhaps the largest weakness is the number of allotments used to distribute state support. The fact is that the precise number of allotments is hard to determine because several of them use multiple sub-formulas. The vast majority of state support is allocated through only a few allotments while numerous other allotments each distribute less than two percent of all state support. The large

number of allotments, however, leads to a variety of potential problems: (1) duplication caused by allotments being focused on similar kinds of cost factors; (2) distribution of a limited amount of money across numerous allotments, which increases the amount of political decisionmaking which must take place over the amounts for each allotment; and (3) the complete elimination of any particular allotment. The interviews we conducted mentioned each one of these issues and our analysis suggests that they apply to some of the allotments, including the duplication of funds for at-risk students, the lack of support for the parameters used as the basis of distributing funds associated with numerous allotments, and the elimination of several allotments over time.

Another weakness of the system is that many allotments are distributed as a fixed amount per student at the same time that the state is expanding flexibility in the use of funds. Using numerous, distinct allotments makes sense if each one requires that funds be used for specific purposes; however the use of multiple allotments interferes with flexibility by implying that funds should be used in specific ways even if they do not necessarily need to be used in those ways.

We believe that a weakness of using statewide salary schedules based on education/experience is that the availability of teachers with particular characteristics may not match the desires of districts for those characteristics. Both the initial interviews and on-site interviews in school districts identified this issue. Our analyses also indicated that district wealth was positively correlated with both teacher experience and proportion of teachers with more than a B.A. degree and that district student-based need was negatively correlated with both teacher experience and proportion of teachers with more than a B.A. degree; it is unlikely that poor districts with relatively high student-based needs are not as interested as wealthy districts in the experience and education levels of their teachers.

We also find that some of the allotments are based on factors that are not consistent with research about the relationship between resources and student performance. For example, paying teachers based on education and experience and promoting the use of teacher assistants, which consumes a large proportion of all state aid distributed through allotments, is not supported widely by research. In contrast, teacher mentors, professional development, and early childhood education – which receive little direct state support – are supported by research.

While we found that there is a positive relationship between the funds distributed by the allotments and the student-based needs of school districts, the relationship is not strong and, in our view, could be strengthened. This result is not because numerous small allotments are not allocated based on specific student needs, but, rather, because some of the largest allotments, including the one for teachers, are not based on student need. In fact, as shown earlier in this report, the variation in the amount of revenue distributed in support of teachers – the largest single allotment by far – is so small that we did not even examine the correlation between that amount on a per student basis and student-based need.

We believe that a couple of allotments (particularly the one for low wealth counties and the supplement for disadvantaged students) are overly complicated and difficult for school district administrators to

understand. While we recognize that some formulas need to be complex, there is a point where complexity undermines comprehension, resulting in a loss of popular support for a good idea.

Finally, the allotments provide little incentive to local school districts to provide their own support for public schools. While it could be argued that the allotment system is independent of local support, a couple of the allotments include calculations based on local tax effort, which suggests that the state is concerned about the availability of local revenue. One problem is that tax effort is measured at the county level and focuses on total tax effort for all county services, not just education, making it difficult to develop a precise incentive.

Potential Modifications to Strengthen Allocation of North Carolina State Aid

The following suggested modifications to the state allocation system are listed *in order of their anticipated ease of implementation*. They should be viewed as being distinct from one another – that is, they could be implemented individually and several of them could be implemented simultaneously but some of them, particularly those toward the end of the list, subsume others that precede them.

In some cases, APA uses parameters to illustrate how a modification might be implemented although such parameters should not be viewed as being precise; if the state were interested in implementing a particular change, further work would need to be done to assure that the cost of implementation would, in fact, be fiscally neutral in part because the data APA used to examine a change was for the 2008-09 year.

1. Combine all allotments that are distributed on the basis of total enrollment (such as the ones for textbooks, instructional materials, non-instructional support, and technology) – not some subcategory of enrollment based on grade level or need – into a single per student allotment, the revenue from which could be used at the discretion of school districts. This modification simply envisions combining allotments into a single dollar amount so that, for example, if three different allotments distribute $50 per student, $32 per student, and $5 per student, respectively, the new single allotment would distribute $87 per student and permit districts to make decisions about how to use such revenue. It should be noted that any existing requirements on the use of revenue obtained from the separate allotments must also be changed as necessary to promote flexibility.

2. Modify the Special Education Allotment by setting three different payment rates for students with disabilities that can be organized into three cost categories based on disability severity (we would refer to the groups as “mild,” “moderate,” and “severe”) and the expected relative cost of each group. The “mild” group might include students with disabilities such as developmentally delayed, hearing impaired, mild intellectual disability, and speech impairment. The “moderate” group might include students with disabilities such as deafness, moderate intellectual disability, orthopedic impairment, serious emotional disability, and visual impairment. The “severe” group might include students with disabilities such as autism, deafness-blindness, severe intellectual disability, multiple disabilities, and traumatic brain injury.

This change would be made in recognition of the fact that while the proportion of students in the mild group is similar across districts, the proportions of students in the moderate and severe groups, who tend to have the highest cost impacts, vary dramatically across all districts (the coefficient of variation of those proportions exceeds .300 in both cases). APA suggests that a fixed proportion (eight to nine percent of all students) be used in counting students with mild disabilities while actual numbers of students with defined disabilities be used to count students in the moderate and severe groups (this approach would eliminate the cap on the number of students used as the basis of distributing special education funds). Based on 2008-09 figures, the allotment levels could be on the order of $2,000 (mild), $5,000 (moderate), and $10,000 (severe) for the three groups of disabilities, which would keep the total cost fiscally neutral (the ratios of these figures to one another – 1.0 : 2.5 : 5.0 – are based on work APA has done in estimating the costs of special education in other states).

We believe that this approach would make the allocation of state support more sensitive to the actual costs districts incur in serving students enrolled in special education programs. While we have not identified a "best" approach to be used in allocating special education aid, the approach we propose includes components used by other states, including the "census-based" approach used in some states (under the census-based approach, the proportion of students in special education is expected to be the same across all districts) and the "pupil-weighted" approach used in other states (under the pupil-weighted approach, students in special education programs are divided into a number of groups, and are weighted to reflect the cost of serving them relative to the cost of serving students with no special needs). Little information exists to conclude definitively that one approach works better than another.

3. Modify the Low Wealth County Allotment by either creating two distinct allotments that would be based on simple formulas (one based on district wealth and another based on district school tax effort) or by creating a single formula that would use a procedure, power equalizing (see the discussion of this concept below), that other states have employed to distribute aid that is both inversely related to wealth and positively associated with tax effort.

   A district wealth allotment could be designed to assure that every district would receive a specific amount per student if its wealth were lower than a specified level. For example, the state could provide $190 per student for every district with equalized assessed valuation less than $500,000 (districts with higher wealth would receive no state aid). Both the $190 and $500,000 figures are used so that the total amount of state aid is fiscally neutral.

   A district school tax effort allotment could be designed to assure that every district would receive a specific amount per student if its tax effort were greater than a specified level. For example, the state could provide $140 per student for every district with a tax effort for

schools greater than $.275 per $100 of equalized assessed property valuation ($.275 is the simple average tax effort across the 115 school districts as calculated by APA). Districts with lower tax effort would receive no state allotment. Both the $140 and $.275 figures are used so that the total amount of state aid is fiscally neutral.

"Power equalizing" is a procedure that takes into consideration both wealth and tax effort and calculates state aid in such a way that every district receives a different amount based on its particular circumstances, with aid decreasing as wealth increases and increasing as tax effort rises. One way to implement a power equalized approach is for the state to guarantee a specific amount of revenue per student for a district at a specified level of wealth and tax effort. For example, if the state guaranteed that all districts with no more than $750,000 of equalized assessed property valuation (wealth) and a property tax rate of at least $.275 for schools (effort) would be able to generate $2,063 per student (the yield of a $.275 tax rate on $750,000 of wealth), then a formula like the following would assure that districts with no more than $750,000 of wealth and effort greater than $.275 would receive aid inversely proportionate to wealth and directly proportionate to effort:

State Aid = (($750,000 - District Wealth)/100))*(District Effort - $.275)

Providing that District Wealth is less than $750,000 and District Effort is greater than .275.

By placing a limit of $1,000 per student on state aid, the total amount the state would pay would be fiscally neutral (in 2008-09).

Since this kind of approach requires knowledge of district tax effort in order to estimate state aid, it might be necessary to use older data in order to develop accurate predictions of state support, which would mean that districts would receive state support with a one year lag, possibly diminishing the value of the aid as an incentive to raise local tax effort.

A few states, such as Kentucky and Louisiana, have used this approach as a "second tier" in their school finance systems for many years.

4. Modify the At-Risk Student Allotment and the Disadvantaged Student Supplemental Fund Allotment by combining them and distributing funds based on either: (1) the number of low performing students in each district or (2) a proxy for low performance, such as the number of Title I eligible students or the number of students eligible for federal lunch support (reduced-price and/or free lunch) but do not use a Census-based count since it does not change annually.

   Our belief is that the primary purpose of funds for at-risk students and/or disadvantaged students is to recognize the added costs of helping students with low performance to overcome whatever gap might exist between the level of their performance and proficiency.

Such costs include a variety of programs and services, from those involving more time during the day and over the course of a year (such as summer school, before-school, after-school, Saturday, etc.) to supplementary personnel (student mentors, student tutors, etc.) to lower class size, and so on. Decisions about how to organize such resources are best left to school districts unless the pattern of performance has become so ingrained as to require more intervention.

We believe that the most direct way to allocate funds for at-risk students is on the basis of student performance. The easiest way to distribute such funds is on the basis of the proportion of students who are not performing at a proficient level. We understand that some policymakers might be uncomfortable with this approach because it appears to create an inappropriate incentive for a district to perform poorly in order to obtain more state aid. In our experience however, we have never met a school administrator or business official that behaves in this way. What is true is that most states that provide funds for at-risk students do so through student weights, which are designed to recognize the cost of serving such students relative to students who have no special needs. Also, most states distribute such funds on the basis of a proxy count (such as free and reduced lunch) of at-risk students both because of concerns about student assessment and in order to avoid the possibility that funds would decrease if student performance improved.

5. Modify the Small County Allotment so that it is focused exclusively on size, which is a well-known cost factor that is beyond the control of school districts. We would suggest allocating funds on the basis of district size, not county size, since the size of the district is what creates the cost pressure that state aid should be used to mitigate. Our experience is that district size is of primary concern when a district is very small (less than 2,000 students) and that cost escalates even further when enrollment drops below 200 students. While the cost curve (size versus cost per student) rises dramatically at the lower end of the enrollment spectrum, North Carolina's districts are not that small. Therefore, we would suggest focusing the allotment for small districts on districts with fewer than about 3,000 students and make it a sliding scale of aid. As an example, a formula might look like:

$$\text{State Aid} = 1{,}600 - (.5 * \text{Enrollment})$$

Such a formula would provide an amount of support that would increases linearly between 500 students and 3,000 students, providing no support above 3,200 students. While some states that provide support for small districts do so using procedures that are curvilinear, that is the case because they are dealing with very small districts, often with under 100 students (as in Colorado, Kansas, and Montana).

If policymakers are concerned about moving from a county-based to a district-based procedure because it provides incentives to non-county districts to remain separate from

the counties in which they are located, we would suggest that they take a more direct approach to consolidating districts. In our experience, using financial incentives, or disincentives, to change the organization structure of school districts has proven to be inefficient. This is because small districts typically choose not to align themselves with other districts for a variety of reasons that have little to do with revenue, from historical population demographics, to ownership of facilities, to high school sports.

6. Change the way that Lottery funds are distributed to support school buildings. Given that the primary responsibility for the construction of school facilities lies with school districts, state aid should be allocated with two objectives in mind: (1) to wealth equalize paying for facilities; and (2) to provide an incentive for school districts to support needed facilities. Current aid is not wealth equalized and our examination suggests that it has not served as an incentive to generate local funds by raising local tax effort (although it is difficult to tell given that tax rates are not disaggregated by purpose). Therefore, we would suggest using an approach based on the power equalizing concept we described above in which the formula would include both wealth (setting the objective as high as possible given available funds) and tax effort (at the statewide average).

7. Modify the Teacher Allotment to change the way the number of teachers each district is allotted by the state is calculated. Because the student-based needs of districts vary, we would suggest using a weighted student count, not the ADM count, to recognize those differences (under the assumption that most special student needs, such as participation in special education programs, are addressed through the use of more teaching personnel (to lower class size and/or to extend student engagement). The weighted student count could be driven by weights implicit in existing allotments and/or by ones we have discussed above, where weights are numbers that reflect the anticipated excess cost of serving students with special needs (or simply translate existing allotment amounts into weights using an agreed upon base cost so as to keep the cost of the new teacher allotment fiscally neutral relative to current levels of state support).

   Our belief is that weights for special education, at-risk students, limited-English proficient (LEP) students, gifted students, and students enrolled in vocational programs should be used. Weights could be created for the three levels of special education discussed above by dividing the three cost figures suggested for mild ($2,000), moderate ($5,000), and severely impaired special education students ($10,000) by a base cost figure such as $4,000 (for a student with no special needs) which would produce excess cost ratios of .50, 1.25, and 2.50 to which a constant of 1.0 would be added to create weights of 1.50, 2.25, and 3.50. Under this approach the cost of serving students with mild disabilities is 150 percent of the cost of serving a student with no special needs. Weights for other needs could be based on the average amount of per student support that is currently being provided relative to a $4,000 base, which would result in weights of 1.15 for LEP students, 1.20 for students performing at

a level less than proficient, 1.30 for gifted students (assuming a constant four percent of gifted enrollment), and 1.50 for students in career and technical education programs.

For example, under the current allotment, a school district that enrolled 2,500 students might be eligible to hire 120 teachers (this is 48 teachers per 1,000 students, about the current statewide average). Assume the district had 225 students with mild disabilities, 60 students with moderate disabilities, 25 students with severe disabilities, 75 LEP students, 1,000 students performing below the proficient level, 100 gifted students (four percent), and 250 students in career and technical education programs. If we apply weights such as those mentioned above, and if we do not use weights for grade level and allow students to receive all weights for which they are eligible, then the number of weighted students would be 3,116.25 and the district would be able to employ 150 teachers (30 teachers more than it receives under the current allotment). At the same time, the district would not receive funds from several current allotments. It should be noted that it would be necessary to obtain information about the characteristics of individual students in order to avoid an individual student earning multiple weights (as is done in Maryland using a student need-based weighted system).

In our view, this change would simplify the allotment system overall, strengthen the teacher allotment, which is supported by education administrators, and focus attention on the needs of school districts in a unified way rather than by having to deal with different kinds of needs separately (our interactions with school administrators suggested that different districts would choose to allocate their resources differently based on their situations and past experiences).

8. Modify the Statewide Teacher Salary Schedule by adding factors that would make it sensitive to uncontrollable cost pressures that districts face in paying teachers. We have shown that two kinds of cost pressures exist in North Carolina: (1) geographic cost differences that reflect differences in prices for consumer goods; and (2) the attractiveness of districts to teachers due to factors such as population sparsity. While some may believe that these cost pressures offset one another, we have shown that they do not necessarily do so in every county, with the result that some counties need to pay more than the statewide average salary, or could pay less than the statewide average salary, in order to attract and retain teachers with similar characteristics (our analysis suggested that some districts use salary supplements to overcome the negative impacts of higher regional cost or lower attractiveness).

   APA created a geographic cost index (GCI) and a teacher attractiveness index (TAI), which are described in Appendix A and which were used in analyzing both individual allotments and the equity of state aid in toto. The indices ranged between .90 and 1.10 around a statewide average of 1.00. One way to take the indices into consideration would be to multiply the GCI for a particular district by the inverse of the TAI (the extent to which

salaries need to rise in order to compensate for unattractiveness) and then multiply all salaries in the schedule by the resulting product, or salary adjustment factor. For example, if the GCI for a county was 1.07 and the TAI for the same county was 1.03, the salary adjustment multiplier would be 1.039 (1.07 * [1/1.03]) and if a particular salary in the statewide schedule was $38,000, it would become $39,482 in that county, reflecting the uncontrollable higher costs in that county).

Should this kind of adjustment be of interest, we suggest doing additional work on the indices, particularly the TAI. Although a few other states have developed something analogous to the GCI, no one else (in academia or elsewhere) has created a TAI and no state uses anything like it in distributing state education support. Therefore if there is support for using the indices before additional research can be undertaken, we would suggest applying them in a more restrictive manner by only using the salary adjustment factor (the product of the GCI and the inverse of the TAI) when it exceeds 1.05 or less than .95. Even then, we would reduce the impact of the salary adjustment factor significantly for instance, by 50 percent: for example if the GCI was 1.04 and the TAI was .96, the product would be 1.083, which would be reduced to 1.042 before being applied to salaries.

9. Modify the way the Teacher Allotment salaries are applied. While many district administrators support the current system of paying individual teacher salaries for eligible positions under the teacher allotment, the approach is cumbersome, requiring significant oversight and tracking of currently employed teachers. An alternative approach would be for the state to pay a total amount to each district to cover the cost of teachers based on multiplying the number of eligible teachers by a statewide average salary adjusted for a variety of district-based factors, such as ones reflecting average education level, average years of experience, geographic cost differences, and teacher attractiveness. Under this approach, each district would receive a lump sum of money, which could be used to pay teachers or, in the name of flexibility, anything the district wants.

   This might work in the following way. First, the state would determine the number of teachers for which it would pay a total amount for salaries. Second, the state would calculate four factors, two of which would be based on the characteristics of teachers hired in the prior year (education level and years of experience) and two of which would be based on indices calculated by the state (the geographic cost index and the teacher attractiveness index); these indices might produce numbers such as 1.16 for education level, 1.08 for years of experience, 1.04 for geographic cost, and .98 (the inverse of teacher attractiveness). Third, the state would multiply the factors together and apply them against the salary level it was able to support (if that figure were $42,000, then the district with the characteristics specified in the second step would be allocated funds based on a figure of $53,630). Finally, the state would multiply the number of eligible teachers by the adjusted salary figure – if the district were eligible to employ 250 teachers, it would receive $13,407,500. Another district, with the same number of teachers but a different set of characteristics, would

receive a different amount (if that district's eligible teachers had less than average education level, .98, average experience, 1.00, lower than average geographic cost, .96, and the inverse of its attractiveness index was 1.03, its adjusted salary would be $40,700 and it would receive a total of $10,175,000).

Some might argue that it is not necessary to take certain teacher characteristics into consideration since those characteristics are not strongly related to student performance. Most states allocate an amount of money per student using some version of a foundation program, as we have discussed previously. Of the states that are interested in teacher salary levels, most set a statewide minimum salary that districts must meet or exceed. A number of states that are members of the SREB (Southern Regional Education Board) modified their state aid allocation systems years ago and moved away from allocating aid on the basis of teachers and statewide salary schedules (notably Kentucky and Louisiana). As far as we know, no research supports one approach over another in terms of any policy interest (impact on student performance, impact on system-wide financial or resource equity, impact on efficiency, and so on).

We refer once again both to North Carolina's almost unique role among the states in providing funding that assures an equitable distribution of resources without any reliance on local funds and to its history of school finance litigation, which suggest that change of the sort proposed here makes sense despite its moving away from what people are used to. We offer it as something to think about that might stimulate a deeper discussion of how best to fund schools.

10. Modify the structure of the Statewide Teacher Salary Schedule. Currently, the statewide teacher salary schedule is based on two teacher characteristics: (1) education level; and (2) years of experience. Almost every school district salary schedule in the nation is based on the same characteristics although they vary in how many credits must be earned before salary is affected and how many years of experience affect salary level. Today, however, many school districts, and a few states, are examining different salary schedule structures. The basic changes being examined include replacing education level with individual professional development plans, de-emphasizing experience, adding multiple roles, levels of leadership and responsibility, and days of work, and adding alternative ways of holding teachers accountable based on student performance, formal evaluation, and individual-based student learning objectives.

    Our suggestion is that North Carolina consider changing the structure of its teacher salary schedule, which is the primary basis for allocating state aid to school districts. We do not have a particular structure to recommend although there are a variety of examples available in districts across the country, including: Denver, Colorado; Austin, Texas; and Charlotte-Mecklenburg, North Carolina. These examples could be used as a starting point to inform a

broader discussion of the types of changes that would best fit the priorities and goals of North Carolina's policymakers, citizens, and education leaders.

11. Our final alternative is the most far-reaching because it combines several of the alternatives discussed above. Under this alternative, the state would create a "foundation" type formula based on setting a base cost with adjustments for student characteristics and district characteristics but, unlike other states, have no expected local revenue contribution to pay the costs. This would make the school finance system in North Carolina analogous to the systems used in most other states (without the local contribution). Additional state aid could still be provided for low wealth school districts, to promote particular programs or services of interest to the state, to provide incentives to districts to generate local funds, for transportation, and for capital purposes. This could be accomplished by adding several "tiers" to the foundation program in the same way we described a second tier above.

    Using the parameters discussed in some of the other alternatives above, basing them on information from 2008-09, and keeping the system fiscally neutral, we would set a base cost at $4,100 per student (taking the state aid of the teacher allotment and all other allotments not specifically based on students with special needs or district characteristics). Then we would use: (1) the student-based weights described above for special education (three levels), low performing students, LEP students, gifted students, and students enrolled in career-technical programs; (2) a formula for district size such as the one described above; and (3) the geographic cost index and the inverse of the teacher attractiveness index to adjust the base for every school district.

    Next, we would suggest creating a second tier of the sort described above, which would allocate state aid using the power equalizing approach to provide greater support both to lower wealth districts and to those that made above average tax effort.

    A third tier would be for transportation, based largely on the existing transportation allotment.

    A fourth tier would be for capital purposes and would be similar to the second tier with revenue restricted to capital purposes. Such revenue could be accumulated over time should a district have no need for the funds or if they are insufficient in a given year.

Appendix A:
Estimating the Fiscal Impacts of Geographic Price Differences and Differences in the Attractiveness of School Districts to Teachers in North Carolina

As a result of both our initial interviews and our review of analyses of North Carolina's school finance system, APA concluded that it was important to estimate the extent to which prices, particularly those associated with salaries, varied across regions of the state. This is the case because uncontrollable price differences are considered to be a primary reason why some school districts raise more local revenue than other school districts do. However, people also feel that some school districts are more attractive to teachers than other districts are and that regional price differences might be correlated with district attractiveness so that whatever adjustment the state might make in allocating state aid that would recognize higher prices in some districts would be completely offset by what it could do, simultaneously, to adjust state aid in some districts that are less attractive to teachers.

APA believes it is unlikely that the magnitude of the fiscal impacts of regional price differences would be exactly equal and opposite to the magnitude of the fiscal impacts associated with regional attractiveness. In order to improve our understanding of both issues (price differences across school districts and school district attractiveness to teachers) we developed two indices:

1) An index of regional price differences, which we call the geographic cost index (GCI) ; and
2) An index of the costs associated with regional attractiveness, which we call the teacher attractiveness index (TAI).

This section describes the procedures we used to estimate each index. Both indices were calculated on a county basis, rather than on the basis of school districts or any other governmental structure, because most of the data used to measure both types of costs are county based.

Geographic Cost Index

As far as regional price differences are concerned, it is commonly accepted that the value of a dollar varies from region to region within a state. That is, a dollar does not purchase the same quantity/quality of a particular resource, such as a teacher, in all school districts. In order to be competitive, school districts must pay different amounts for a teacher with similar characteristics simply to recognize that the cost of living in one area is different from that in another area.

Despite the widespread recognition of this situation, only a few states have quantified such price differences and used price estimates to modify the distribution of state support to school districts. Even among the states that estimate price differences, the methodology used to do so varies. One state might

use a "market-basket" approach (as is used to calculate an inflation index)[11] while another state might use regional wages for government employees, and yet another state might use a statistical approach based on predicting salaries and distinguishing factors that are controlled by school districts (such as characteristics of teachers) from those that are *not* controlled by school districts (such as characteristics of students or district wealth).

APA's approach to analyzing regional cost differences was to focus on the costs of paying for labor. We choose to focus on labor because, as in most states, employee costs in North Carolina represent on average approximately 80 percent of all school district operating costs making it by far the most important driver of cost differences among districts. Because the remaining 20 percent of district costs are almost impossible to measure (there are a large number of components, such as groceries or electricity, and both their prices and quantity of usage need to be determined) we hold this 20 percent constant across districts; that is:

Geographic Cost Index (GCI) = (.80 x Cost of Labor) + .20

In order to develop the cost of labor, we used three sets of information:

1. The Council for Community and Economic Research (ACCRA)[12] cost of living data for metropolitan areas in North Carolina;

2. U.S. Department of Housing and Urban Development (HUD) estimates of the market cost of two and three bedroom apartments in each county; and

3. National Center for Education Statistics (NCES) information developed by William Fowler and Lori Taylor for most school districts in the nation.

The cost of labor was calculated based on two figures, a cost of living and a comparable wage index, each of which was weighted equally as follows:

Cost of Labor = (.50 x Cost of Living index) + (.50 x Comparable Wage index)

Using the ACCRA data and the HUD data, APA divided the cost of living into two categories: housing and non-housing expenses.

[11] The market-basket approach examines price information for a wide variety of items and weights them based on the quantity of the items typically purchased by consumers, such as individuals or school districts.

[12] For more information, visit the ACCRA Web site at http://www.accra.org/index.asp

- Housing costs: To address employee housing costs, APA used HUD data to calculate the estimated cost of a 2.5 bedroom rental in each county.

- Non-housing costs: From the ACCRA data APA calculated an average cost of non-housing expenses for as many counties in the state as we could (18) and applied the average of these to all other counties where data were unavailable. An average can be used for these costs because non-housing expenses (especially in non-metropolitan areas) vary much less from place to place than housing costs do.

Once housing and non-housing costs were identified, APA was able to calculate a county cost of living index. First, APA calculated state averages, weighting for population, and scaled the scores so that the state averaged 1.00. Then, APA created a cost of living index by weighting the non-housing costs at 72 percent and the housing costs at 28 percent. These percentages are consistent with the national average as shown by ACCRA data.

To include the employer aspect of cost of labor, APA then scaled the comparable wage index developed by NCES for college graduates so that the state average was 1.00. The comparable wage index reflects the competitive wages school districts pay to attract and retain teachers.

Following the formulaic procedures described above, we created the geographic cost index (GCI) by weighting the cost of labor index by .80 and adding .20 to it. The GCI for North Carolina counties estimates the relative costs for each county in the state. The mean GCI across all counties is 1.00 and a value of 1.10 indicates a cost 10 percent above the state's mean. GCI figures are shown in Table X-1, where the range is from .92 (eight percent below the statewide average) to 1.11 (11 percent above the statewide average).

Teacher Attractiveness Index

Unlike the case of regional price differences, APA is unaware that any index of the costs associated with the attractiveness of different regions in a state to teachers has ever been calculated, much less used by any state in allocating state aid. Therefore, APA had to develop both a theory for how differences in attractiveness of regions (counties) could be identified and a procedure to develop an index that would reflect the cost impact of such differences.

We began by developing an equation that used a series of variables to predict "attractiveness" using the rate of teacher turnover as a proxy variable for attractiveness. Total turnover of teachers is a figure for which data were available for all school districts (and which could be combined into data for all counties). Under the assumption that at least part of the explanation for a low rate of turnover is a high level of attractiveness, such turnover data is as good an indicator of attractiveness as is available.

APA used two different kinds of variables in the equation to predict teacher turnover: (1) a set of variables that were outside the control of school districts such as crime rate, poverty level, population density, density of consumer businesses (such as banks, retail stores, and restaurants), district size (enrollment level), and proportions of students with different kinds of special needs (such as limited-English proficient [LEP] and low income); and (2) a set of variables that could be considered to be within the control of school districts, such as number of teachers relative to students, number of teacher aides relative to teachers, supplemental pay for teachers, and teacher experience. We used a statistical procedure, linear regression, to attempt to explain turnover based on all of the variables. In fact, the total correlation between all variables and teacher turnover was about .66 (that is, taken together, the variables explained about 44 percent of the variation in the rate of teacher turnover across all counties. We used the results of the regression procedure to create an equation that could be used to predict turnover, as follows:

Teacher Turnover = .097 + (.005 X percentage of population in poverty) –

(.00001243 X population density) - (.262 X property crime rate) – (.002 X unemployment rate) – (.0000001516 X number of students) + (.112 X percent of students eligible for free lunch) – (.181 X LEP percent) + (.028 X number of teacher aides per teacher) + .00001192 X average teacher salary supplement) – (.008 X average teacher experience)

In order to create the index, however, instead of using county data for all variables listed in the equation above, we only used county data for those variables not controlled by school districts. For variables that are controlled by districts, we used statewide average figures as constants (that is, they had the same value across all districts). This approach, sometimes referred to as a hedonic approach, is used in Texas to develop that state's geographic cost differential.

Once we had a set of predicted figures for each county, we needed to create an index that would have a statewide average of 1.00; in doing so we set the standard deviation of the index at the same level as the standard deviation of the price index (which was .046). We did this by translating predicted values of turnover to z-score format and multiplying all z-scores by .046. We added 1.00 to the result in order to make the statewide average 1.00 rather than 0.00, which resulted in the figures shown in Appendix Table 1 below, which are named the Teacher Attractiveness Index (TAI).

The Relationship between the GCI and the TAI

The figures in Appendix Table 1 show the GCI and the Teacher Attractiveness Index (TAI) for all counties in two ways. First, counties are shown in order of their official county number (from 10 to 995) and both the TAI and the GCI are indicated; then each index is shown separately ranked from low to high. The TAI ranges from .90 to 1.11 while the GCI ranges from .92 to 1.11. Both indices have an average of 1.00 and a standard deviation of .046.

The GCI represents the extent to which one county must pay more for teachers in order to employ people of comparable quality given price differences that are beyond the control of the school districts in the counties. The TAI represents the extent to which one county is more attractive to teachers than another county is.

The two indices could be used to adjust teacher salaries so as to neutralize the impact of both factors – the GCI by raising salaries and the TAI by lowering salaries (or applying the inverse of the TAI). For example, if a county had a GCI of 1.05 and a TAI of 1.05 then salaries would be adjusted by multiplying by 1.05 for the GCI and dividing by 1.05 for the TAI, which would result in no adjustment being made; that is, in that county, the advantage provided by the TAI is completely offset by the disadvantage of the GCI. Since the correlation between the two indices is .55 (or .55 between the GCI and the inverse of the TAI), the two indices are related to one another but do not offset one another in all counties.

If we set cut-off points to define high, medium, and low levels of both the TAI and the GCI indices (high being greater than 1.04, low being less than .96, and medium being between .96 and 1.04), then among the 100 counties:

- 49 counties have medium levels of both indices
- Nine counties are high on both indices
- Two counties are low on both indices, and
- Only one county is high on one index and low on the other index.
- Among the other 39 counties, 13 counties are high on one index and medium on the other index while 26 counties are low on one index and medium on the other index.

One way to determine how the indices work together is to invert the TAI (that is, divide 1.00 by the TAI so that a figure above 1.00 indicates a need for funds to compensate for low attractiveness) and multiply it by the GCI (because a number above 1.00 indicates a need for funds to compensate for high prices). If the two figures were equal but opposite to one another, the product would be close to 1.00.

In fact, for 68 counties, the product is between .96 and 1.04; however, in 18 counties the product is greater than 1.04 (Anson, Bertie, Currituck, Durham, Edgecombe, Franklin, Gaston, Greene, Halifax, Hertford, Jones, Northampton, Orange, Pitt, Robeson, Scotland, Warren, and Washington) – indicating a higher cost – and in 14 counties the product is less than .96 (Ashe, Avery, Camden, Carteret, Catawba, Clay, Dare, Duplin, Macon, Mitchell, Montgomery, Nash-Rocky Mount, Stanly, and Watauga) – indicating a lower cost.

Our conclusion is that there are both price differences and teacher attractiveness differences between counties in North Carolina for which the financial implications can be measured. Some counties face cost pressures associated with conditions that are beyond their control. While the two cost pressures offset each other to a large extent in numerous counties, in others, the combined impact of both price differences and alleviating problems of attractiveness have significant financial implications.

APPENDIX TABLE 1

DISPLAY OF TEACHER ATTRACTIVENESS INDEX (TAI) AND GEOGRAPHIC COST INDEX (GCI) BY COUNTY IN NORTH CAROLINA

County Name	Attractiveness and Geographic Cost Indices: Teacher Attractiveness Index (TAI)	Geographic Cost Index (GCI)	Combined Fiscal Impact of TAI and GCI
Alamance-Burlington	1.08	1.05	0.97
Alexander County	1.04	1.00	0.96
Alleghany County	0.98	0.99	1.01
Anson County	0.93	1.06	1.14
Ashe County	1.01	0.92	0.91
Avery County	0.99	0.94	0.95
Beaufort County	0.97	0.97	1.00
Bertie County	0.90	0.97	1.07
Bladen County	0.93	0.96	1.03
Brunswick County	1.02	1.04	1.03
Buncombe County	1.02	1.01	0.99
Burke County	1.02	1.00	0.98
Cabarrus County	1.05	1.10	1.04
Caldwell County	1.01	1.00	0.98
Camden County	1.06	0.96	0.91
Carteret County	1.03	0.98	0.95
Caswell County	0.97	0.97	0.99
Catawba County	1.06	0.98	0.93
Chatham County	1.06	1.09	1.03
Cherokee County	0.98	0.95	0.97
Edenton-Chowan	0.96	0.96	1.00
Clay County	1.01	0.95	0.94
Cleveland County	1.00	0.99	0.99
Columbus County	0.94	0.95	1.01
Craven County	1.00	0.98	0.98
Cumberland County	1.01	1.03	1.02
Currituck County	1.05	1.10	1.05
Dare County	1.10	1.00	0.91
Davidson County	1.02	0.98	0.96
Davie County	1.06	1.04	0.98
Duplin County	0.99	0.94	0.95
Durham County	1.04	1.10	1.05
Edgecombe County	0.93	0.99	1.06
Forsyth County	1.04	1.03	0.99
Franklin County	1.00	1.09	1.09
Gaston County	1.02	1.09	1.07
Gates County	0.99	0.96	0.97
Graham County	0.97	0.95	0.98
Granville County	1.00	0.99	0.99
Greene County	0.96	1.01	1.05
Guilford County	1.04	1.05	1.00
Halifax County	0.91	0.97	1.07
Harnett County	0.99	0.98	0.99
Haywood County	1.01	0.99	0.98
Henderson County	1.04	1.00	0.97
Hertford County	0.91	0.97	1.07
Hoke County	0.98	1.02	1.04
Hyde County	0.94	0.96	1.03
Iredell-Statesville	1.06	1.06	1.00
Jackson County	0.99	0.96	0.97
Johnston County	1.04	1.09	1.04
Jones County	0.94	0.98	1.05

Couunties Ranked by TAI: Name	Teacher Attractiveness Index
Bertie County	0.90
Washington County	0.90
Halifax County	0.91
Robeson County	0.91
Hertford County	0.91
Northampton County	0.91
Tyrrell County	0.92
Warren County	0.93
Anson County	0.93
Scotland County	0.93
Edgecombe County	0.93
Bladen County	0.93
Columbus County	0.94
Hyde County	0.94
Jones County	0.94
Vance County	0.95
Richmond County	0.95
Martin County	0.95
Greene County	0.96
Edenton-Chowan	0.96
Lenoir County	0.97
Pasquotank County	0.97
Perquimans County	0.97
Beaufort County	0.97
Graham County	0.97
Caswell County	0.97
Sampson County	0.98
Wilson County	0.98
Pitt County	0.98
Alleghany County	0.98
Hoke County	0.98
Yancey County	0.98
Swain County	0.98
McDowell County	0.98
Pamlico County	0.98
Cherokee County	0.98
Rutherford County	0.99
Avery County	0.99
Jackson County	0.99
Duplin County	0.99
Mitchell County	0.99
Harnett County	0.99
Gates County	0.99
Madison County	1.00
Cleveland County	1.00
Franklin County	1.00
Montgomery County	1.00
Wilkes County	1.00
Craven County	1.00
Wayne County	1.00
Pender County	1.00
Granville County	1.00

Counties Ranked by GCI: Name	Geographic Cost Index
Yancey County	0.92
Ashe County	0.92
Avery County	0.94
Mitchell County	0.94
Duplin County	0.94
Montgomery County	0.94
Sampson County	0.95
Washington County	0.95
Columbus County	0.95
Cherokee County	0.95
Clay County	0.95
Graham County	0.95
Swain County	0.95
Stanly County	0.96
Macon County	0.96
Jackson County	0.96
Bladen County	0.96
Watauga County	0.96
Camden County	0.96
Edenton-Chowan	0.96
Gates County	0.96
Hyde County	0.96
Perquimans County	0.96
Tyrrell County	0.96
McDowell County	0.97
Caswell County	0.97
Bertie County	0.97
Martin County	0.97
Northampton County	0.97
Pasquotank County	0.97
Halifax County	0.97
Onslow County	0.97
Beaufort County	0.97
Pamlico County	0.97
Hertford County	0.97
Vance County	0.98
Rutherford County	0.98
Warren County	0.98
Harnett County	0.98
Davidson County	0.98
Jones County	0.98
Carteret County	0.98
Catawba County	0.98
Craven County	0.98
Lee County	0.98
Robeson County	0.98
Wilkes County	0.99
Lenoir County	0.99
Edgecombe County	0.99
Nash-Rocky Mount	0.99
Polk County	0.99
Granville County	0.99

Lee County	1.02	0.98	0.96
Lenoir County	0.97	0.99	1.02
Lincoln County	1.05	1.01	0.96
Macon County	1.01	0.96	0.95
Madison County	1.00	1.00	1.01
Martin County	0.95	0.97	1.01
McDowell County	0.98	0.97	0.98
Mecklenburg County	1.10	1.09	1.00
Mitchell County	0.99	0.94	0.95
Montgomery County	1.00	0.94	0.94
Moore County	1.03	1.02	0.99
Nash-Rocky Mount	1.06	0.99	0.93
New Hanover County	1.04	1.04	1.01
Northampton County	0.91	0.97	1.06
Onslow County	1.01	0.97	0.96
Orange County	1.06	1.11	1.05
Pamlico County	0.98	0.97	0.99
Pasquotank County	0.97	0.97	1.00
Pender County	1.00	1.01	1.01
Perquimans County	0.97	0.96	0.99
Person County	1.01	1.05	1.04
Pitt County	0.98	1.04	1.06
Polk County	1.03	0.99	0.96
Randolph County	1.04	1.05	1.00
Richmond County	0.95	0.99	1.04
Robeson County	0.91	0.98	1.08
Rockingham County	1.01	1.03	1.02
Rown-Salisbury	1.02	1.04	1.02
Rutherford County	0.99	0.98	0.99
Sampson County	0.98	0.95	0.97
Scotland County	0.93	1.00	1.07
Stanly County	1.03	0.96	0.93
Stokes County	1.03	1.04	1.01
Surry County	1.01	0.99	0.98
Swain County	0.98	0.95	0.97
Transylvania County	1.01	0.99	0.98
Tyrrell County	0.92	0.96	1.04
Union County	1.06	1.10	1.03
Vance County	0.95	0.98	1.03
Wake County	1.11	1.10	0.99
Warren County	0.93	0.98	1.06
Washington County	0.90	0.95	1.05
Watauga County	1.03	0.96	0.94
Wayne County	1.00	1.00	1.00
Wilkes County	1.00	0.99	0.99
Wilson County	0.98	1.00	1.02
Yadkin County	1.04	1.04	1.00
Yancey County	0.98	0.92	0.93

Cumberland County	1.01
Haywood County	1.01
Rockingham County	1.01
Person County	1.01
Macon County	1.01
Clay County	1.01
Onslow County	1.01
Surry County	1.01
Caldwell County	1.01
Transylvania County	1.01
Ashe County	1.01
Burke County	1.02
Brunswick County	1.02
Rown-Salisbury	1.02
Gaston County	1.02
Lee County	1.02
Buncombe County	1.02
Davidson County	1.02
Watauga County	1.03
Polk County	1.03
Stanly County	1.03
Stokes County	1.03
Moore County	1.03
Carteret County	1.03
New Hanover County	1.04
Henderson County	1.04
Johnston County	1.04
Durham County	1.04
Alexander County	1.04
Yadkin County	1.04
Guilford County	1.04
Forsyth County	1.04
Randolph County	1.04
Lincoln County	1.05
Currituck County	1.05
Cabarrus County	1.05
Orange County	1.06
Camden County	1.06
Iredell-Statesville	1.06
Nash-Rocky Mount	1.06
Catawba County	1.06
Chatham County	1.06
Davie County	1.06
Union County	1.06
Alamance-Burlington	1.08
Dare County	1.10
Mecklenburg County	1.10
Wake County	1.11

Richmond County	0.99
Alleghany County	0.99
Cleveland County	0.99
Surry County	0.99
Haywood County	0.99
Transylvania County	0.99
Wilson County	1.00
Alexander County	1.00
Burke County	1.00
Caldwell County	1.00
Dare County	1.00
Scotland County	1.00
Wayne County	1.00
Henderson County	1.00
Madison County	1.00
Lincoln County	1.01
Buncombe County	1.01
Pender County	1.01
Greene County	1.01
Hoke County	1.02
Moore County	1.02
Rockingham County	1.03
Cumberland County	1.03
Forsyth County	1.03
Rown-Salisbury	1.04
Pitt County	1.04
New Hanover County	1.04
Brunswick County	1.04
Davie County	1.04
Stokes County	1.04
Yadkin County	1.04
Guilford County	1.05
Randolph County	1.05
Alamance-Burlington	1.05
Person County	1.05
Iredell-Statesville	1.06
Anson County	1.06
Franklin County	1.09
Johnston County	1.09
Gaston County	1.09
Chatham County	1.09
Mecklenburg County	1.09
Durham County	1.10
Cabarrus County	1.10
Union County	1.10
Wake County	1.10
Currituck County	1.10
Orange County	1.11

Statewide Statistics

Simple Average	1.00	1.00	1.00
Minimum	0.90	0.92	0.91
Maximum	1.11	1.11	1.14
Simple Standard Deviation	0.046	0.046	0.044

Correlation

CAI with GCI	0.55