Recalibrating North Dakota's Per Pupil Number for its School Foundation Program

First Draft

Prepared for the

North Dakota Interim Education Funding Committee

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January 2014

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EXECUTIVE SUMMARY

This report uses the Evidence-Based model, developed over the past several years by Picus Odden and Associates, to recalibrate the foundation expenditure per pupil figures enacted by the 2013 Legislature for the state's school finance formula. These figures -- $8,810 for the 2013-14 school year and $9,092 for the 2014-15 school year – were derived from the $7,293 adequacy figure in our 2008 study for the North Dakota Education Improvement Commission, *Funding Schools Adequately in North Dakota: Resources to Double Student Performance* (Odden, Picus, Goetz, Aportela & Archibald, 2008).

The $7,293 figure was developed using the Evidence-Based model with data from the 2006-07 school year to calculate an adequate foundation expenditure per pupil figure for the 2007-08 school year. The $8,810 and $9,092 figures were derived by compounding the initial foundation level of $7,293 by 3.2 percent a year beginning with the 2007-08 school year

The Evidence-Based model provides the staffing and dollar resources displayed in Table X1 for prototypical schools as the basis for a recalibration of the Per Pupil figure in the North Dakota School funding system. The model today also includes a prototypical central office and a prototypical maintenance and operations program.

Table X1
Recalibrated Resources for
Prototypical North Dakota Elementary, Middle and High Schools

School Element	Elementary Schools	Middle Schools	High Schools
School Characteristics School configuration	K-5	6-8	9-12
1. Full-day kindergarten	Yes	NA	NA
2. Prototypical school size	450	450	600
3. Average Class size	K-3: 15 4-5: 25	6-8: 25	9-12: 25
Number of teacher work days	192 teacher work days, an increase of 8 days.	192 teacher work days, an increase of 8 days.	192 teacher work days, an increase of 8 days.
Personnel Resources			
3. Core teachers	26	18	24
4. Specialist teachers	20% more: 5.2	20% more: 3.6	1/3 more: 8.0
5. Instructional Coaches	2.25	2.25	3.0
6. Tutors	1.0 and an additional 1.0 for every 125 at-risk students	1.0 and an additional 1.0 for every 125 at-risk students	1.0 and an additional 1.0 for every 125 at-risk students
7. Extended Day	3.33 FTE per 100 at-risk students, paid at 25%, equivalent to 1 FTE per 120 at-risk students	3.33 FTE per 100 at-risk students, paid at 25%, equivalent to 1 FTE per 120 at-risk students	3.33 FTE per 100 at-risk students, paid at 25%, equivalent to 1 FTE per 120 at-risk students
8. Summer School	Keep current summer school weight of 0.6 subject to Spring analysis	Keep current summer school weight of 0.6 subject to Spring analysis	Keep current summer school weight of 0.6 subject to Spring analysis
9. Teachers for ELL students	Retain current three level weights subject to Spring analysis	Retain current three level weights subject to Spring analysis	Retain current three level weights subject to Spring analysis
10a. Learning and mild disabled students	1 teacher and 1 aide for every 150 students	1 teacher and 1 aide for every 150 students	1 teacher and 1 aide for every 150 students
10b. Severely disabled students	100% state reimbursement of high costs	100% state reimbursement of high costs	100% state reimbursement of high costs
11. Alternative Schools	NA	Keep current weight of 0.15 subject to Spring analysis	Keep current weight of 0.25 subject to Spring analysis

Table X1 (continued)
Recalibrated Resources for
for Prototypical North Dakota Elementary, Middle and High Schools

School Element	Elementary Schools	Middle Schools	High Schools
School Characteristics			
12. Gifted and Talented	$25/student	$25/student	$25/student
13. Substitutes	10 days per teacher = additional 5% of teachers	10 days per teacher = additional 5% of teachers	10 days per teacher == additional 5% of teachers
14. Pupil support staff	1 Guidance Counselor per 450 students (1) & 1 Nurse per 750 students **Plus** 1 Pupil Support Staff Position for every 125 at-risk students	1 Guidance Counselor per 250 students (1.8) & 1 Nurse per 750 students **Plus** 1 Pupil Support Staff Position for every 125 at-risk students	1 Guidance Counselor per 250 students (2.4) & 1 Nurse per 750 students **Plus** 1 Pupil Support Staff Position for every 125 at-risk students
15. Non-Instructional Aides	2.0	2.0	3.0
16. Librarians/media specialists	1.0	1.0	1.0
17. Principal and Assistant Principal	1	1 plus 0.5 Asst. Principal	1 plus 1.0 Asst. Principal
18. School Site Secretary	2.0 Secretaries	2.0 Secretaries	3.0 Secretaries
19. Professional development	Included above: Instructional coaches Planning & prep time 10 summer days **Additional:** $100/pupil for other PD expenses – trainers, conferences, travel, etc.	Included above: Instructional coaches Planning & prep time 10 summer days **Additional:** $100/pupil for other PD expenses – trainers, conferences, travel, etc.	Included above: Instructional coaches Planning & prep time 10 summer days **Additional:** $100/pupil for other PD expenses – trainers, conferences, travel, etc.
Dollar/Pupil Resources			
20. Technology	$250/pupil	$250/pupil	$250/pupil
21. Instructional materials, formative assessments	$140/pupil $30/pupil	$140/pupil $30/pupil	$175/pupil $30/pupil
22. Student Activities	$200/pupil	$200/pupil	$250/pupil
23. Central Administration	$625 per pupil	$625 per pupil	$625 per pupil
24.Operation and Maintenance – Actual 1012-13	$1,167 per pupil	$1,167 per pupil	$1,167 per pupil

Table X2 shows estimates of the recalibrated Per pupil figure. Using the actual average salaries and benefits for 2012-13, the recalibrated Per Pupil figure would be $8,529 as compared to the $8,810 figure used in the foundation formula. Using salaries inflated just by an average CPI inflation figure of 2% over the six years from 2007 to 2013, the recalibrated Per pupil figure would be $8,191. And using the 3.2% figure actually used to inflate the $7,293 figure from the 2008 adequacy study, the recalibrated Per Pupil figure would be $8,624. All of these estimates are lower than the actual $8,810 enacted by the 2013 Legislature, which suggests that the North Dakota school funding formula provides adequate funding for the base program.

Table X2:
Recalibrated Per Pupil Figures Compared to $8,810 Used in 2014 Funding Formula

Per Pupil Figure	Using Actual Average Salaries for 2012-13*	Inflating Salaries by 2% CPI from 2008*	Inflating Salaries by 3.2 % from 2008*
Prototypical District of 3900 Students	$8,529	$8,191	$8,624
Small District at 390 Students	$9,017	$8,626	$9,152
Small District at 195 Students	$9,483	$9,082	$9,636
Small District at 97.5 Students	$13,980	$13,484	$14,344

*Includes eight extra days for professional development.

Recalibrating North Dakota's Per Pupil Number for its School Foundation Program

INTRODUCTION AND OVERVIEW

This report uses the Evidence-Based model, developed over the past several years by Picus Odden and Associates, to recalibrate the foundation expenditure per pupil figures enacted by the 2013 legislature for the state's school finance formula.[1] These figures -- $8,810 for the 2014 school year and $9,092 for the 2015 school year – were derived from the $7,293 adequacy figure in our 2008 study for the North Dakota Education Improvement Commission, *Funding Schools Adequately in North Dakota: Resources to Double Student Performance* (Odden, Picus, Goetz, Aportela & Archibald, 2008).

The $7,293 figure was developed using the Evidence-Based model with data from the 2006-07 school year to calculate an adequate foundation expenditure per pupil figure for the 2007-08 school year. The $8,810 and $9,092 figures were derived by compounding the initial foundation level of $7,293 by 3.2 percent a year beginning with the 2007-08 school year

Prior to 2013-13 the state used a relatively complicated school funding formula. That formula used a two-part approach to determining state aid and included a complex system of property tax reduction components. The Legislature simplified the formula in the 2013, replacing the two part formula with a foundation program. The foundation level was set at $8,810 for 2013-14 and $9,092 for 2014-15, values it determined to be adequate for the state's schools. The purpose of this study is to ascertain whether or not these levels are, in fact, adequate.

The main principle behind the state's school funding formula is that every student in elementary and secondary education in North Dakota should have a base of financial support (the foundation expenditure per pupil level) that is adequate to allow their school district to provide a quality education. This should be the case, regardless of where the student lives or how much taxable valuation is available to the local school district. The per pupil figure in the foundation formula represents that financial base adequacy level. The EB approach to determining adequacy follows the same principle.

We add to that the principle that if districts expend the funds provided by the base Per Pupil figure to support the ten strategies to improve student performance embedded in the Evidence-Based model, schools and districts should be able to produce large improvements in student academic achievement. This would include achieving proficiency in college and career ready curriculum standards. In other words, the EB approach not only provides an adequate base fiscal foundation but also positions schools to use those resources to dramatically boost student learning.

[1] For additional discussion see also Odden & Picus, 2014.

Ten Steps to Improving Student Performance

The Evidence-Based model that we use to estimate an adequate spending level for schools is based on two major types of research:

1. Reviews of research on the student achievement effects of each of the model's major elements
2. Studies of schools and districts that have dramatically improved student performance over a 4-6 year period – what we have sometimes labeled "a doubling of student performance" on state tests.

We have summarized these findings not only in our textbook (see Odden & Picus, 2014) but also in several books that profile schools and districts that have moved the student achievement needle (e.g., Odden & Archibald, 2009; Odden, 2009; Odden, 2012). Furthermore, we have studied other dramatically improving schools in Vermont and Maine where we have recently conducted school finance studies. We found the theory of improvement embodied in the Evidence-Based model is reflected in nearly all these cases (see Picus, Odden, et al., 2011; Picus, Odden, et al., 2013). We also found similar strategies in the improving North Dakota schools we studied for our 2008 report. Thus, our model for adequately funding schools also signals how districts and schools can use the funds for programs and strategies that would allow them to produce dramatic gains in student academic performance.

In general, we find that schools and districts that produce large gains in student performance follow ten similar strategies, resources for which are included in the EB model:

1. Analyze student data to become deeply knowledgeable about performance issues and to understand the nature of the achievement gap. The test score analysis first includes analysis of state test results and then the use over time of formative and benchmark assessments to help tailor instruction to precise student needs.

   In North Dakota, nearly every school we studied used the Northwest Evaluation Association's Measure of Academic Progress (MAP) assessment program to benchmark student progress and tailor instruction to meet student needs.

2. Set higher goals including: aiming to educate 95 percent of the students in the school to proficiency or higher on the state exam; seeing that a significant portion of the school's students reach advanced achievement levels; and make significant progress in closing the achievement gap.

   In North Dakota, schools that set more aggressive goals made more progress than schools that simply tried to meet AYP requirements. In other words, schools producing large, measurable gains in student performance set ambitious student performance goals and most came close to attaining those goals.

3. Review evidence on good instruction and effective curriculum. Successful schools throw out the old curriculum, replace it with a different and more rigorous curriculum, and over

time create their specific view of what good instructional practice was to deliver that curriculum.

Most of the schools we studied in North Dakota adopted new curriculum and textbook materials, and over time an approach to instructional practice that was aligned with that curriculum. Changing curriculum will be a must for schools implementing more rigorous college and career ready standards.

4. Invest heavily in teacher training that includes intensive summer institutes and longer teacher work years, and provide resources for trainers and, most importantly, fund instructional coaches in all schools. Time is provided for teacher collaboration focused on improving instruction.

   This was a key finding in all North Dakota schools. All used more than the 2 professional development days required by the state, and most wanted to increase the number of days substantially, sometimes to as long as two weeks, but did not have the funds to do so. Further, many of the schools used full- or part-time instructional coaches to help teachers deploy new instructional practices in their own classroom, and all schools that that did so, hoped for more resources to support such coaches over time.

5. Provide extra help for struggling students and, with a combination of state funds and federal Title 1 funds, provide some combination of tutoring in a 1-1, 1-3, or 1-5 format. In some cases this also included extended days, summer school, and English language development for all ELL students.

   The North Dakota schools studied provided a series of extra help strategies for students struggling to meet standards, and many provided some combination of tutoring, before or after school academic help assistance, and summer school. There were resource rooms more focused on "remedial" efforts in some cases, but those schools did not make the largest amounts of improvements.

6. Create smaller classes in early elementary years often lowering class sizes in grades K-3 to 15 citing research from randomized trials.

   This was not a very prominent strategy in North Dakota, in part because most class sizes were already relatively small.

7. Restructure the school day to provide more effective ways to deliver instruction. This includes multi-age classrooms in elementary schools and block schedules and double periods of mathematics and reading in secondary schools. Schools also "protect" instructional time for core subjects, especially reading and mathematics.

   Restructuring school time was a modest element of the strategies in the North Dakota cases, although protecting academic instructional times was more prominent. The cases did document schools' using "planning and preparation" periods for a variety of

collaborative activities for various teacher teams to work on curriculum, data-based decision making and instructional issues.

8. Support by strong leadership around data-based decision making and improving the instructional program, by the superintendent, the principal and teacher leaders.

   This was a strong feature in all of the North Dakota cases. First, principals were clear leaders in all cases. Second, nearly all schools created a series of teams each of which provided leadership roles for teachers, from grade level team leader, to chair of a school wide instructional team, to instructional coach. The cases showed that both principals and teachers provided a range of instructional leadership functions.

9. In the process create professional school cultures characterized by ongoing discussion of good instruction and by teachers taking responsibility for the student performance results of their actions.

   Several schools in North Dakota explicitly tried to create professional learning communities through the collaborative activities of teachers, teacher leaders and the principals over student performance data based analysis, instructional improvement and implementing new textbooks and other curriculum material.

10. Bring external professional knowledge into the school, e.g., hiring experts to provide training, adopting research-based new curricula, discussing research on good instruction, and working with regional education service agencies as well as the state department of education.

    Several of the North Dakota schools brought in multiple outside experts, had teachers read research and through other means tried to bring the best professional practice into their school.

In sum, all of the schools we studied in North Dakota and around the country are schools that boosted student performance deploying a set of strategies that are highly aligned with those embedded in the Evidence-Based model. These practices bolster our claim that if such funds are provided, and are used in these effective ways, then significant student performance gains should follow. In the sections that follow, we describe an evidence-based approach to identifying the resources needed by *all* schools to dramatically improve student performance in in all core subjects and at all grade levels.

USING THE EVIDENCE-BASED APPROACH TO RECALIBRATE NORTH DAKOTA'S FOUNDATION EXPENDITURE PER PUPIL LEVEL FOR 2014 AND 2015

This report uses the Evidence-Based model to recalibrate the foundation expenditure per pupil figure for North Dakota. The following includes seven sections:

- General recommendations
- Staffing recommendations for core staffing
- Staffing recommendations for extra help strategies for struggling students
- Dollar per pupil recommendations
- Recommendations for the central office and operations/maintenance
- Recommendations for small district adjustments.
- Using the results to estimate recalibrated Per Pupil figures.

Table 1 below provides a summary of all the recalibration recommendations suggested by the Evidence-Based model. The following text provides a comparison of current North Dakota policy to the Evidence-Based model recommendation, followed by analysis and evidence behind the Evidence-Based model's ratios and formulas. Picus Odden and Associates has also built a computer simulation that will allow the Committee and the Legislature to change any element of the recalibrated Per Pupil number and see the impact on the altered Per Pupil number.

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4. Specialist teachers	20% more: 5.2	20% more: 3.6	1/3 more: 8.0
5. Instructional Coaches	2.25	2.25	3.0
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Dollar/Pupil Resources			
20. Technology	$250/pupil	$250/pupil	$250/pupil
21. Instructional materials, formative assessments	$140/pupil $30/pupil	$140/pupil $30/pupil	$175/pupil $30/pupil
22. Student Activities	$200/pupil	$200/pupil	$250/pupil
23. Central Administration	$625per pupil	$625 per pupil	$625 per pupil
24.Operation and Maintenance – Actual 1012-13	$1,167 per pupil	$1,167 per pupil	$1,167 per pupil

GENERAL RECOMMENDATIONS

This section covers full-day kindergarten and school size.

1. Full Day Kindergarten

Current North Dakota Policy	Evidence-Based Model
School districts must provide a half-day kindergarten program; most provide a full day program. Kindergarten students are counted as 1.0 pupils if enrolled in a full day and proportionately less for programs that are not full day, down to a minimum of a half day program.	Kindergarten students are counted as 1.0 students for the state aid formula. The staff FTE these students generate are added to the core teacher counts (Element 3) and then used to generate elective teacher positions, professional development and other school wide resources, as discussed below. The $7,293 figure included this element.

Analysis and Evidence: Research shows that full-day kindergarten, particularly for students from low-income backgrounds, has significant, positive effects on student learning in the early elementary grades (Gullo, 2000; Slavin, Karweit & Wasik, 1994). Fusaro's (1997) late 1990s meta-analysis of 23 studies comparing the achievement effect of full-day kindergarten to half-day kindergarten programs, found an average effect size of +0.77,[2] which is quite substantial. Children participating in full-day kindergarten programs do better in learning the basic skills of reading, writing, and mathematics in the primary grades than children who receive only a half-day program or no kindergarten at all (see also Lee, Burkam, Ready, Honigman & Meisels, 2006).

In 2003, using nationally-representative, longitudinal data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS–K), Denton, West & Walston (2003) showed that children who attended full-day kindergarten had a greater ability to demonstrate reading knowledge and skill than their peers in half-day programs, across the range of family backgrounds. Cooper, et al.'s (2010) comprehensive meta-analysis reached similar conclusions finding the average effect size of students in full day versus half-day kindergarten to be +0.25. Moreover, a *randomized controlled trial*, the "gold standard" of education research, found the effect of full-day versus half-day kindergarten to be about +0.75 standard deviations (Elicker & Mathur, 1997). As a result of this research, funding full day kindergarten for 5 year-olds as well as for 4 year-olds is an increasingly common practice among the states (Kauerz, 2005).

[2] Effect size is the amount of a standard deviation in higher performance that the program produces for students who participate in the program versus students who do not. An effect size of 1.0 would indicate that the average student's performance would move from the 50th to the 83rd percentile. The research field generally recognizes effect sizes greater than 0.25 as significant and greater than 0.50 as substantial.

Since research suggests that children from all backgrounds can benefit from full-day kindergarten programs, the EB model provides support for a full day program for all students, by counting such students as 1.0 in the state aid formula.

2. District and School Size

Current North Dakota Policy	Evidence-Based Model
North Dakota has no specific school policy on school size. And school sizes differ substantially across the state.	To indicate the relative level of resources in schools, the EB model uses prototypical school units of: • 450 student K-5 elementary schools • 450 student 6-8 middle schools • 600 student 9-12 high schools Most resources are estimated at the school level and then aggregated up to the district level. A prototypical district size of 3900 is also identified in order to estimate district resources (Elements 23 and 24).

The EB model identifies resources for prototypical elementary, middle and high schools, and a prototypical district, and needs to use specific sizes in order for the prototypes to indicate the relative level of resources in the schools. Thus we will make comments on school and district sizes but in no way imply North Dakota should adopt any new policy on either.

Analysis and evidence. School sizes differ substantially within and across all states. No state have a specific policy on school size, though some – including New Jersey and Wyoming – have prototypical schools sizes for developing and/or operating their funding formula, and many others include "ideal" size configurations for different levels of schools in their facility guidelines.

Research on school size is clearer than research on class size. Most of the research on school size addresses the question of whether large schools – those significantly over 1,000 students – are both more efficient and more effective than smaller school units (schools of 300 to 500) – and whether cost savings and performance improvements can be identified by consolidating small schools or districts into larger entities. The research generally shows that school units of roughly 400-600 elementary students and between 500 and 1,000 secondary students are the most effective and most efficient (Lee & Smith, 1997; Raywid, 1997/1998).

Moreover, the research on diseconomies of small and large scale, which needs to assess both costs and outcomes, generally does not provide solid evidence for a consolidation policy. From an economic perspective, the concept of diseconomies of scale includes both costs and outputs. In an early 1981 review of the literature, Fox (1981) concluded that little research had analyzed output in combination with input and size variables. Ten years later, after assessing the meager extant research that did address costs as well as outcomes, Monk (1990) concluded that there was little support for either school or district consolidation.

In more recent reviews of scale economies and diseconomies and potential cost savings from consolidation, Andrews, Duncombe & Yinger (2002) and Duncombe and Yinger (2007, 2010)

found that the optimum size for elementary schools was in the 300-500 pupil range, and for high schools was in the 600-900 range. Both findings suggest that the very large urban districts and schools across America are far beyond the optimum size and perhaps need to be downsized somehow, and that the potential cost savings from consolidation of small districts and schools are realistically scant. In sum, the research suggests that elementary school *units* be in the range of 400-500 students and that secondary school *units* be in the range of 500-1,000 students.

The EB approach starts by identifying resources for prototypical elementary, middle and high schools with enrollments of 450, 450 and 600 respectively. It uses this approach and these prototypes to indicate the relative level of resources in schools. These prototypical school sizes reflect research on the most effective school sizes, although in reality few schools are exactly the size of the prototypes. Further, as discussed in Element 23, the EB model also begins with a prototypical district size of 3,900, which comprises four 450-student elementary schools, two 450-student middle schools, and two 600-student high schools. As a result, the general formulas can be designed in a way that school and district resources can be proportionately reduced or increased based on how a school and district enrollment compares to the prototypical models. Or as the case in Arkansas, the model can be used to estimate a district level revenue per pupil figure, which also has been the approach taken by North Dakota as well as this analytic effort. The EB prototypes should not be construed to imply that North Dakota needs to replace all school sites with smaller or larger buildings or address consolidation; they are used as heuristics to determine the estimated per pupil figure.

The EB model also makes adjustments for districts and schools with enrollments much smaller than the above prototypes, down to districts with 97 or fewer students (See Table 13 on page 71).

STAFFING FOR THE CORE PROGRAMS IN PROTOTYPICAL SCHOOLS

This section covers personnel staffing for the major elements of the regular education program: core teachers, elective teachers, and instructional coaches.

3. Core Teachers/Class Size

Current North Dakota Policy	Evidence-Based Model
North Dakota does not have a policy on class size embedded in the school aid formula. However, it does have standards for class size for school accreditation. For one grade classes, the standards recommend class sizes of 20 for grades K-3 in elementary schools, with a maximum not to exceed 25 students. The standards recommend class sizes of 25 for grades 4-12, with a maximum not to exceed 30 students. A secondary school unit is allowed to have 3 percent of its classes above the 30 student maximum, but not more than 34 students. Again for secondary schools, science and career and technical classes cannot exceed the capacity for the learning stations provided. Finally, instrumental and vocal music classes in secondary schools are exempt from class size standards. For schools with two grades per class, enrollment cannot exceed 20 students for grades K-3 or 25 students for grades 4-8. For schools with three grades/class, enrollment cannot exceed 15 students for grades K-8, and for schools with 4 grades per class, enrollment cannot exceed 10 students for grades K-8. Unlike many states with numerous small schools, North Dakota assumes that such schools will have classes with students from multiple grades.	Staffing ratios for **core teachers** are: • 15 to 1 for grades K-3 • 25 to 1 for grades 4-12 Core teachers are defined as the grade-level classroom teachers in elementary schools and the core subject (e.g., mathematics, science, language arts, social studies and world language, including such subjects taught as Advanced Placement in high schools) teachers in middle and high schools. Elective teachers are discussed in the next section (Element 4). Additional teacher resources for specific student needs are also discussed below (Elements 6-11). With these class size recommendations, an elementary *school* of 450 students would receive 26 core teachers, a middle *school* of 450 students would receive 18 core teachers, and a high *school* of 600 students would receive 24 core teachers. *These core teachers would not be the only teaching staff in these schools. Several of the following sections recommend a variety of additional teachers for all school levels.* The $7,293 figure included this element.

Analysis and evidence: In staffing schools and classrooms, the most expensive decision superintendents and principals make is on class sizes.

The gold standard of educational research is randomized controlled trials, which provide scientific evidence on the impact of a certain treatment (Mosteller, 1995). Thus, the primary evidence on the impact of small classes today is the Tennessee STAR study, which was a large scale, *randomized controlled experiment* of class sizes of approximately 15 compared to a

control group of classes with approximately 24 students in kindergarten through grade 3 (Finn and Achilles, 1999; Word, et al., 1990). The study found that students in the small classes achieved at a significantly higher level (effect size of about 0.25 standard deviations) than those in regular class sizes, and that the impacts were even larger (effect size of about 0.50) for low income and minority students (Finn, 2002; Grissmer, 1999; Krueger, 2002). The same research also showed that a regular class of 24-25 with a teacher and an instructional aide *did not* produce a discernible positive impact on student achievement, a finding that undercuts proposals and wide spread practices that place instructional aides in elementary classrooms (Gerber, Finn, Achilles, & Boyd-Zaharias, 2001).

Subsequent research showed the positive impacts of the small classes in the Tennessee study persist into middle and high school years, and the years beyond high school (Finn, Gerger, Achilles & J.B. Zaharias, 2001; Konstantopulos & Chung, 2009; Krueger, 2002; Mishel & Rothstein, 2002; Nye, Hedges & Konstantopulos, 2001a, 2001b). Longitudinal research on class size reduction also found that the lasting benefits of small classes include a reduction in the achievement gap in reading and mathematics in later grades (Krueger & Whitmore, 2001).

Although some argue that the impact of the small class sizes is derived primarily from kindergarten and grade 1, Konstantopoulos and Chung (2009) found that the longer students were in small classes (i.e., in grades K, 1, 2 and 3) the greater the impact on grade 4-8 achievement. They concluded that the full treatment – small classes in all of the first four grades – had the greatest short and long term impacts.

Though differences in analytic methods and conclusions characterize some of the debate over class size (see Hanushek, 2002 and Krueger, 2002), we side with those concluding that class size makes a difference, but only class sizes of approximately 15 students with one teacher (and not class sizes of 30 with an aide or two teachers) and only for kindergarten through grade 3.

Evidence on the most effective class sizes in grades 4-12 is harder to find. Most of the research on class size reduction has been conducted at the elementary level. Thus, we look for evidence on the most appropriate secondary class size from typical and best practices to make a decision on class sizes for these grades. First, the national average class size in middle and high schools is about 25. Second, nearly all comprehensive school reform models are developed on the basis of a class size of 25 (Odden, 1997a; Stringfield, Ross & Smith, 1996), a conclusion on class size reached by the dozens of experts who created these whole-school design models. Although many professional judgment panels in other states have recommended secondary class sizes of 20, none cited research or best practices to support such a proposal.

Finally in these times when funds for schools are scarce, it is legitimate to raise the issue of the cost of small classes versus the benefits. Whitehurst and Chingos (2011) argue that though the Tennessee STAR study supports the efficacy of small classes, there is other research today that produced more ambiguous conclusions. However, they also note that the other research includes class size reductions in grades above K-3 and "natural experiments" rather than randomized controlled trials. Most importantly, they also conclude that while the costs of small classes are high, the benefits, particularly the long-term benefits, outweigh the costs and conclude that small class sizes in grades K-3 "pay their way."

4. Elective Teachers and Planning and Preparation Time/Collaborative Professional Development

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for elective teachers in North Dakota education or school finance policy. It is a personnel resource that districts and schools can and do buy with local and state equalization dollars provided through the general fund.	Resources for elective teachers are provided in addition to the number of core teachers, at the following rate: • 20 percent for K-5 grade elementary teachers • 20 percent for 6-8 grade middle school teachers • 33 1/3 percent for 9-12 grade high school teachers We define elective teachers as all teachers for subject areas not included in the core. For example, art, music, physical education, health, and career and technical education, etc. The $7,293 figure included this element. Core teachers are discussed in the previous section (Element 3). Additional teacher resources for specific student needs are also discussed below (Elements 6-11).

<u>Analysis and evidence</u>. North Dakota accreditation standards and new high school graduation standards require minimum instructional minutes or courses for several elective classes in elementary, middle and high schools including such subjects as art, music, library skills, physical education, health and career technical education. In other words, in addition to the core subjects addressed above, schools need to provide a solid well-rounded curriculum including art, music, library skills, career-technical and physical education.

Teachers also need some time during the regular school day to work collaboratively and engage in job-embedded professional development. Providing every teacher one period a day for collaborative planning and focused professional development requires an additional 20 percent allocation for elective teachers. Using this elective staff allocation, every teacher – core and elective – would teach 5 of 6 periods during the day, and have one period for planning, preparation and collaborative work. One of the most important elements of effective collaborative work is team-focused data-based decision making, using student data to improve instructional practices, now shown to be effective by a recent *randomized controlled trial* (Carlson, Borman & Robinson, 2011).

The 20 percent additional staff is adequate for elementary and middle schools, but a different argument can be made for high schools. If the goal is to have more high school students take a core set of rigorous academic courses, and learn that material at a high level of thinking and problem solving, one could argue from cognitive research findings (Bransford, Brown and Cocking, 1999; Donovan & Bransford, 2005a, 2005b, 2005c) that a block schedule that allows for longer class periods is a better way to organize the instructional time of the school. Typical block scheduling for high schools would require elective teachers at a rate of 33 1/3 percent of the number of core teachers, so the school can create a schedule with four 90-minute blocks where teachers provide instruction for three of those 90-minute blocks and have one block – or 90 minutes – for planning, preparation and collaboration each day. This type of block schedule could be operated with students taking four courses each semester attending the same classes each day, or with students taking eight courses each semester while attending different classes every other day. Such a schedule could also entail a few "skinny" blocks (45 minute periods) for some classes. Each of these specific ways of structuring a block schedule, however, would require an additional 33 1/3 percent of the number of core teachers to serve in the role of elective teachers to provide the regular teacher with a "block" for planning, preparation and collaboration each day.

In totaling the core plus the elective teachers from the recommendations above, the total teaching staff is 31.2 for the prototypical 450 FTE elementary, 21.6 for the 450 FTE middle and 32 for the prototypical 600 FTE high school. *Again, we note that the next set of recommendations provide a variety of additional staff for all schools. Core and elective teachers are not the only professional or the only teaching staff for each school.*

It should be noted that this staffing recommendation for high schools would be sufficient for high schools to provide all students with a rigorous set of courses over the grades 9-12, and an appropriate number of classes for increased state high school graduation requirements that could be as demanding as those of the American High School Diploma recommended by Achieve. More specifically, these staffing recommendations would be adequate for the state to require 3 and even four years of both mathematics and science for high school graduation.

In our 2008 study, we found that many schools in North Dakota are organized on a 7 period rather than a 6 period day. In Class A districts, a teacher generally teaches only 5 of those 7 periods, which means that the district would require an additional 40 percent of the number of core teachers for specialist and elective teacher positions. In Class B districts, teachers generally teach 6 of the 7 periods. Many of the Professional Judgment panel members argued that schools need to provide a wider array of specialist and elective courses, including more career-technical courses in secondary schools. The argument was that such elective classes keep many students, especially those not academically oriented, in school.

The electives recommendation described above does not provide sufficient resources for either middle schools or high schools to offer a 7 period day and require teachers to work only 5 of those periods. We do not do so for two primary reasons. First, we are calibrating our recommendations on strategies and resources to dramatically improve student performance in the core subjects of reading/English/language arts, mathematics, science, history/geography and world language, in part by providing nearly an hour of instruction in each of these subjects daily.

Restructuring the day to add a seventh period by reducing the minutes of instruction in core subjects to add a seventh period is not a strategy that will boost performance in those subjects, regardless of the arguments about the motivational aspects of elective classes. Second, increasing the provision of specialist and elective teachers to 40 percent in both middle and high schools would be more costly. Therefore, we conclude that a recommendation of 40 percent specialists and elective teachers in secondary schools would result in added costs and a potential decrease in instructional effectiveness for the core subjects, something that is not aligned with the framework for our approach to adequacy.

The legislature could choose to increase elective teachers for either or both middle and high schools. The simulation model that we are developing for this part of the study will be able to immediately provide information on the costs of increasing such resources and its effect on the Per Pupil figure.

5. Instructional Coaches

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for instructional coaches in North Dakota education or school finance policy. Instructional coaches are personnel resources that districts and schools can buy with local and state equalization dollars through the general fund, and it is an emerging new resource that schools across the country are providing in student performance improvement initiatives. There is a biennium appropriation of $2.3 million for the Education Standards Board to provide mentoring for first year teachers, and if no need for first year teachers, for teachers needing help in certain areas.	EB provides one instructional coach position for every 200 students. The EB model does not specifically fund technology curriculum support positions, however, schools and districts can use coaching FTE to fulfill such a technology role if needed. The $7,293 figure included this element.

Analysis and evidence. Only a few states (e.g., Arkansas, New Jersey and Wyoming) explicitly provide resources for school and classroom-based instructional coaches, yet instructional coaches are key to making professional development work (see Element 19). Most comprehensive school designs (see Odden, 1997; Stringfield, Ross & Smith, 1996), and EB studies conducted in other states – Arizona, Arkansas, Kentucky, Maine, North Dakota, Washington and Wisconsin – call for school-based instructional facilitators or instructional coaches (sometimes called mentors, site coaches, curriculum specialists, or lead teachers).

These individuals coordinate the instructional program but most importantly provide the critical ongoing instructional coaching and mentoring that the professional development literature shows is necessary for teachers to improve their instructional practice (Garet, Porter, Desimone, Birman, & Yoon, 2001; Joyce & Calhoun, 1996; Joyce & Showers, 2002). This means that they spend the bulk of their time in classrooms, modeling lessons, giving feedback to teachers, working with teacher collaborative teams, and generally helping to improve the instructional program. We expand on the rationale for these individuals in the section on professional development, but include them here as they represent teacher positions. The few instructional coaches who also function as school technology coordinators would provide the technological expertise to fix small problems with the computer system, install all software, connect computer equipment so it can be used for both instructional and management purposes, and provide professional development to embed computer technologies into a school's curriculum.

Early research found strong effect sizes (1.25-2.71) for coaches as part of professional development (Joyce & Calhoun, 1996; Joyce & Showers, 2002). A 2010 evaluation of a Florida program that provided reading coaches for middle schools found positive impacts on student performance in reading (Lockwood, McCombs & Marsh, 2010). A related study found that coaches provided as part of a data-based decision making initiative also improved both teachers' instructional practice and student achievement (Marsh, McCombs & Martorell, 2010). More importantly, a recent *randomized controlled trial* of coaching (Pianta, Allen & King, 2011)

found significant, positive impacts in the form of student achievement gains across four subject areas – mathematics, science, history and language arts. This gold standard of research provides further support to this element as an effective strategy to boost student learning.

In terms of numbers of coaches, several comprehensive school designs suggest that although one instructional coach might be sufficient for the first year of implementation of a school-wide program, additional instructional coaches are needed in subsequent years. Moreover, the technology designs recommend a full-time facilitator who spends at least half-time as the site's technology expert. Thus, drawing from all programs, we conclude that 1.0 FTE instructional coaches/technology coordinators are needed for every 200 students in a school. This resourcing strategy works for elementary as well as middle and high schools.

This staffing strategy translates into 2.25 FTE instructional coaches for the 450-student prototypical elementary school, 2.25 FTE instructional coaches for the 450-student middle school, and 3.0 FTE instructional coaches for the 600-student high school.

Although instructional coaching positions are identified as FTE positions, schools could divide the responsibilities across several individual teachers. For example, the 2.25 positions in elementary schools could be structured for 4 teacher/instructional coaches providing instruction 50 percent of the time, and functioning as a curriculum coaches in reading, mathematics, science and technology for 50 percent of the time. The same allocation of functions across individuals could work for the middle and high schools.

We also note that the above staff, combined with the additional elements of professional development discussed below, focus on making Tier 1 instruction (in the Response to Intervention frame) as effective as possible, thus providing a solid foundation of high quality instruction for everyone, including students who will struggle more to learn to proficiency.

STAFFING FOR EXTRA STUDENT NEEDS

Because not all students will learn to performance standards with only the core instructional program, districts and schools need a powerful sequence of additional and effective strategies for struggling students. The EB approach identifies a series of specific, extra-help programs for struggling students including:

- Tutoring to provide immediate, intensive assistance to keep struggling students on track
- Extended day programs to provide more time on task for struggling students
- Summer school to provide more instructional time for struggling students
- Sheltered English and ESL instruction for English Language Learning (ELL) students
- A census approach to funding special education

These programs all extend the learning time for struggling students in focused ways. The key concept is to implement the maxim of standards-based education reform: keep standards high for all students but vary the instructional time so all students can achieve to proficiency levels. The EB elements for extra help are also embedded in the "response to intervention" schema.

- Tier 1 includes the regular instruction provided to all students. The proposals for class size, time for collaborative work during regular school hours and ongoing, systemic professional development are designed to make core instruction as effective as possible.
- Tier 2 includes the staffing for tutoring, extended day and summer school, with the tutoring staff covering nearly all possible small group Tier 2 intervention programs.
- Tier 3 includes ELL and special education which provides the more intensive extra help services for these special populations.

For tutors, extended day and summer school, the EB model uses the number of students eligible for free and reduced-price lunch to estimate the number of students who might need extra help to achieve to standards in each school; this is the same pupil figure North Dakota uses for its at-risk weight.

These resources for students struggling to achieve to academic standards should be viewed in concert with resources for students with real disabilities. In some states like North Dakota with a paucity of current resources for struggling students, districts often over identify students for special education services as the "only" way to trigger more resources for some struggling students. Our goal in expanding resources for struggling students triggered by at-risk (poverty) and ELL counts is to provide adequate resources for all struggling students, with or without a diagnosed disability, and to reduce over identification in special education. The EB model provides additional *pupil support* resources for students based on at-risk (poverty) counts as well.

North Dakota addresses this issue of the need for extra help for struggling students by providing several pupil weights. The funding formula provides weights for:

- At risk students of 0.025, which are the target for the above tutoring, extended day, summer school and extra pupil support programs
- ELL students from 0.07 to 0.3, which are also addressed by the EB model

- Students with disabilities of 0.082 for all ADM, which are also addressed by the EB model
- Alternative middle (0.15) and high (0.25) schools, also addressed by the EB model
- Home education of 0.20, not addressed by the EB model
- Cross state border attendance of 0.20, not addressed by the EB model
- Migrant summer school of 1.0, not addressed by the EB model
- Data collection of 0.03, not addressed by the EB model, and
- Regional service agencies of 0.02, not addressed by the EB model.
- The state also provides grants for gifted and talented students.

This section of the report addresses programs for at risk, ELL, special education, alternative school and gifted and talented students, but does not convert the recommendations into weights. We will work with several key school business and other education leaders in the Spring and bring recommendations for student weights for all of the above categories for the second part of the study, which will be conducted following our meeting with the committee in January.

6. Tutoring

Current North Dakota Policy	Evidence-Based Model
North Dakota applies a student weight of 0.025 for "at risk" students, which are defined as students eligible for free or reduced price lunch. The state also requires that districts hire 1 licensed tutor for every 400 K-3 students, in addition to those supported with Federal Title 1 funds.	One (1) fully licensed teacher-tutor position for every prototypical school plus 1 tutor position for every 125 at risk pupils categorized as eligible for free and reduced price lunch. These positions are provided additional days for professional development (Element 19) and substitute days (Element 13) discussed below. The $7,293 figure included one tutor position for each prototypical school. Tutors are not the only resources in the EB model aimed at struggling students. See Elements 7 and 8 below for a discussion of extended day and summer school resources.

As noted above, in our costing analyses and work in the spring, we will transform all recommendations for extra resources for struggling students into pupil weights applied to the recalibrated foundation expenditure per pupil level.

Analysis and evidence. The most powerful and effective extra help strategy to enable struggling students to meet state standards is individual one-to-one tutoring provided by licensed teachers (Shanahan, 1998; Wasik & Slavin, 1993). Students who must work harder and need more assistance to achieve to proficiency levels (i.e. students who are ELL, low income, or have minor disabilities) especially benefit from preventative tutoring (Cohen, Kulik, & Kulik, 1982). Tutoring program effect sizes vary by the components of the approach used, e.g. the nature and structure of the tutoring program, but effect sizes on student learning reported in meta-analyses range from 0.4 to 2.5 (Shanahan, 1998; Wasik & Slavin,1993; Cohen, Kulik & Kulik, 1982) with an average of about 0.75 (Wasik & Slavin, 1993).

The impact of tutoring programs depends on how they are staffed and organized, their relation to the core program, and tutoring intensity. Researchers (Cohen, Kulik, & Kulik, 1982; Farkas, 1998; Shanahan, 1998; Wasik & Slavin, 1993) and experts on tutoring practices (Gordon, 2009) have found greater effects when the tutoring includes the following:

- Professional teachers as tutors
- Tutoring initially provided to students on a one-to-one basis
- Tutors trained in specific tutoring strategies
- Tutoring tightly aligned to the regular curriculum and to the specific learning challenges, with appropriate content specific scaffolding and modeling
- Sufficient time for the tutoring

- Highly structured programming, both substantively and organizationally.

We note several specific structural features of effective one-to-one tutoring programs:

- First, each tutor would tutor one student every 20 minutes, or three students per hour. This would allow one tutor position to tutor 18 students a day. (Since tutoring is such an intensive activity, individual teachers might spend only half their time tutoring; but a 1.0 FTE tutoring position would allow 18 students per day to receive 1-1 tutoring.). Four positions would allow 72 students to receive individual tutoring daily in the prototypical elementary and middle schools.
- Second, most students do not require tutoring all year long; tutoring programs generally assess students quarterly and change tutoring arrangements. With modest changes such as these, close to half the student body of a 400-pupil school unit could receive individual tutoring during the year.
- Third, not all students who are from a low-income background require individual tutoring, so a portion of the allocation could be used for students in the school who might not be from a lower income family but nevertheless have a learning issue that could be remedied by tutoring.

Though this discussion focuses on *individual* tutoring, schools could also deploy these resources for small group tutoring. In a detailed review of the evidence on how to structure a variety of early intervention supports to prevent reading failure, Torgeson (2004) shows how one-to-one tutoring, one-to-three tutoring, and one-to-five small group sessions (all Tier 2 interventions) can be combined for different students to enhance their chances of learning to read successfully.

One-to-one tutoring would be reserved for the students with the most severe reading difficulties, scoring say, at or below the 20th or 25th percentile on a norm referenced test. Intensive instruction for groups of three-to-five students would then be provided for students above that level but below the proficiency level.

It is important to note that the instruction for all student groups needing extra help needs to be more explicit and sequenced than that for other students. Young children with weakness in knowledge of letters, letter sound relationships and phonemic awareness need explicit and systematic instruction to help them first decode and then learn to read and comprehend. As Torgeson (2004:12) states:

> Explicit instruction is instruction that does not leave anything to chance and does not make assumptions about skills and knowledge that children will acquire on their own. For example, explicit instruction requires teachers to directly make connections between letters in print and the sounds of words, and it requires that these relationships be taught in a comprehensive fashion. Evidence for this is found in a recent study of preventive instruction given to a group of high at-risk children in kindergarten, first grade and second grade …..only the most [phonemically] explicit intervention produced a reliable increase in the growth of word-reading ability … schools must be prepared to provide very explicit and systematic instruction in beginning word-reading skills to some of their students if they expect virtually all

> children to acquire work-reading skills at grade level by the third grade …. Further, explicit instruction also requires that the meanings of words be directly taught and be explicitly practiced so that they are accessible when children are reading text…. Finally, it requires not only direct practice to build fluency…. but also careful, sequential instruction and practice in the use of comprehension strategies to help construct meaning.

Torgeson (2004) goes on to state that meta-analyses consistently show the positive effects of reducing reading group size (Elbaum, Vaughn, Hughes & Moody, 1999) and identifies experiments with both one-to-three and one-to-five teacher-student groupings. Though one-to-one tutoring works with 20 minutes of tutoring per student, a one-to-three or one-to-five grouping requires a longer instructional time for the small group – up to 45 minutes. The two latter groupings, with 45 minutes of instruction, reduced the rate of reading failure to a miniscule percentage.

For example, if the recommended numbers of tutors are used for such small groups, a one FTE reading position could teach 30 students a day in the one-to-three setting with 30 minutes of instruction per group, and 30+ students a day in the one-to-five setting with 45 minutes of instruction per group. Four FTE tutoring positions could then provide this type of intensive instruction for up to 120 students daily. In short, though we have emphasized 1-1 tutoring, and some students need 1-1 tutoring, other small group practices (which characterize the bulk of Tier 2 interventions) can also work, with the length of instruction for the small group increasing as the size of the group increases.

Though Torgeson (2004) states that similar interventions can work with middle and high school students, the effect, unfortunately, is smaller as it is much more difficult to undo the lasting damage of not learning to read when students enter middle and high schools with severe reading deficiencies.

An important issue is how many tutors to provide for schools with differing numbers of at-risk students. Drawing from the standard of many comprehensive school designs and the above discussion of service levels, the EB model generally provides one fully licensed teacher-tutor position for every 100 pupils eligible for free and reduced price lunch. Using the prototypical schools, this standard would provide from one to four and a half professional teacher-tutor positions for the prototypical elementary and middle schools, and up to six for the prototypical high school, the maximum number being reached only if all students in a school are eligible for free and reduced lunch.

However, the Professional Judgment panels in our 2008 study suggested that schools with small at-risk student counts still would have some struggling students and suggested a minimum of one tutor position for each prototypical school along with a reduction in the formula for allocating the remainder of tutoring positions, a modification we thought made sense. So the prototypical schools in North Dakota all include one tutor for struggling students in the base allocation, with the additional allocation being one tutor position for every 125 at risk students. Tutors also are provided the additional days for professional development discussed below and as well as substitute days.

As is clear below, these strategies are augmented by additional services for struggling students including extended-day programs, summer school, extra pupil support/parent outreach resources based on at-risk student counts, for ELL students, alternative high school programs and additional assistance for students with disabilities.

7. Extended-day programs

Current North Dakota Policy	Evidence-Based Model
North Dakota has no specific policy on extended day programs designed to provide academic help to students struggling to learn to state standards, but districts can use the funds from the current at risk student weight for such instructional services	One (1) teacher position for every 30 at-risk students (or 3.33 FTE per 100 such students): • Position is paid at the rate of 25 percent of the position's annual salary—enough to pay a teacher for a 2-hour extended-day program, 5 days per week. • This formula equates to 1 teacher position for every 120 students eligible for free or reduced price lunch. These resources could be used for a different mix of teachers and other non-certified staff, with teachers providing at least one hour of homework help or after school tutoring. These positions are provided additional days for professional development (Element 19) and substitute days (Element 13 discussed below).

Analysis and evidence: At both elementary and secondary school levels, some struggling students are likely to benefit from after-school or extended-day programs, even if receiving Tier 2 interventions during the regular school day. Extended day programs are created to provide academic support as well as to provide a safe environment for children and adolescents to spend time after the school day ends.

In a review of research, Vandell, Pierce and Dadisman (2005) found that well designed and administered after-school programs yield numerous improvements in academic and behavioral outcomes (see also Fashola, 1998; Posner & Vandell, 1994). On the other hand, the evaluation of the 21st Century Community Learning Centers (CCLC) Program (James-Burdumy et al., 2005), though hotly debated, indicated that for elementary students, extended day programs did not appear to produce measurable academic improvement. Critics of this study (Vandell, Pierce & Dadisman, 2005) argued that the control groups had higher pre-existing achievement, which reduced the potential for finding program impact. They also argued that the small impacts that were identified had more to do with lack of full program implementation during the initial years than with the strength of the program.

Overall, studies have documented positive effects of extended day programs on the academic performance of students in select after-school programs. However, the evidence is mixed both because of research methods (few randomized trials), poor program quality and imperfect implementation of the programs studied. Researchers have identified several structural and institutional supports necessary to make after-school programs effective:

- Staff qualifications and support (staff training in child or adolescent development, after-school programming, elementary or secondary education, and content areas offered in the program, staff expertise; staff stability/turnover; compensation; institutional supports)
- Program/group size and configuration (enrollment size, ages served, group size, age groupings and child staff ratio) and a program culture of mastery
- Financial resources and budget (dedicated space and facilities that support skill development and mastery, equipment and materials to promote skill development and mastery; curricular resources in relevant content areas; location that is accessible to youth and families)
- Program partnerships and connections (with schools to connect administrators, teachers and programs; with larger networks of programs, with parents and community)
- Program sustainability strategies (institutional partners, networks, linkages; community linkages that support enhanced services; long term alliances to ensure long term funding).

The resources recommend in the EB model would be used to provide struggling students in all elementary grades and in secondary schools with additional help during the school year but before or after the normal school day. Because not all low income students will need or will attend an after school program, the EB model assumes 50 percent of the free and reduced-price lunch eligible pupils will attend the program – a need and participation figure identified by Kleiner, Nolin and Chapman (2004). As a result providing resources at a rate of 1 FTE teacher to 30 free and reduced price lunch students will result in class sizes of approximately 15 in extended day programs.

The state should monitor over time the degree to which the estimated 50 percent figure accurately estimates the numbers of students needing extended-day programs. We also encourage North Dakota to require districts to track the students participating in the programs, their pre- and post-program test scores, and the specific nature of the after school program provided, to develop a knowledge base about which after-school program structures have the most impact on student learning. We recognize that how these extended day services are provide will vary across North Dakota's districts, and that any monitoring of the impacts of these resources should focus more on impacts on student performance than the strategy for providing the services. We also found that most of the schools we studied in North Dakota and in several others states that improved student performance had various combinations of before and after school extra help programs.

8. Summer School

Current North Dakota Policy	Evidence-Based Model
North Dakota provides a weight of 0.60 for every ADM student attending an approved summer school program.	One (1) teacher position for every 30 at risk students (or 3.33 FTE per 100 such students). • Position is paid at the rate of 25% of salary, which also provides time for planning and preparation and collaborative work. • This formula equates to 1 teacher position for every 120 economically disadvantaged students. These positions are provided additional days for professional development (Element 19) and substitute days (Element 13) discussed below.

Analysis and evidence. Many students need extra instructional time to achieve the state's high proficiency standards. Thus, summer school programs should be part of the set of programs available to provide struggling students the additional time and help they need to achieve to standards and earn academic promotion from grade to grade (Borman, 2001). Providing additional time to help all students master the same content is an initiative that is grounded in research (National Education Commission on Time and Learning, 1994).

Research dating back to 1906 shows that students, *on average*, lose a little more than a month's worth of skill or knowledge over the summer break (Cooper, Nye, Charlton, Lindsay, & Greathouse, 1996). Summer breaks have a larger deleterious impact on poor children's reading and mathematics achievement. This loss can reach as much as one-third of the learning during a regular nine-month school year (Cooper et al., 1996). A longitudinal study by Alexander and Entwisle (1996) showed that these income-based summer learning differences *accumulate* over the elementary school years, such that poor children's achievement scores – without summer school – fall further and further behind the scores of middle class students as they progress through school grade by grade. As a result of this research, there is emerging consensus that what happens (or does not happen) during the summer can significantly impact the achievement of students from low-income and at-risk backgrounds, and help reduce (or increase) the poor and minority achievement gaps in the United States (see also Heyns, 1978).

However, evidence on the effectiveness of summer programs in attaining either of these goals is mixed. Although past research linking student achievement to summer programs shows some promise, several studies suffer from methodological shortcomings and the low quality of the summer school programs themselves (Borman & Boulay, 2004).

A meta-analysis of 93 summer school programs (Cooper, Charlton, Valentine, & Muhlenbruck, 2000) found that the average student in summer programs outperformed about 56% to 60% of similar students not receiving the programs. However, the certainty of these conclusions is

compromised because only a small number of studies (e.g., Borman, Rachuba, Hewes, Boulay & Kaplan, 2001) used random assignment, and program quality varied substantially. Other *randomized controlled trial* research of summer school reached more positive conclusions about how such programs can positively impact student learning (Borman & Dowling, 2006; Borman, Goetz & Dowling, 2009), and Roberts (2000) found an effect size of 0.42 in reading achievement for a *randomized sample* of 325 students who participated in the Voyager summer school program.

Researchers note several program components related to improved achievement effects for summer program attendees, including:

- Early intervention during elementary school
- A full 6-8 week summer program
- A clear focus on mathematics and reading achievement, or failed courses for high school students
- Small-group or individualized instruction
- Parent involvement and participation
- Careful scrutiny for treatment fidelity, including monitoring to ensure good instruction in reading and mathematics is being delivered
- Monitoring student attendance.

Summer programs that include these elements hold promise for improving the achievement of at-risk students and closing the achievement gap. Indeed, the most recent review of the effects of summer school programs reached this same conclusion (Kim & Quinn, 2013). Their meta-analysis of 41 school- and home-based summer school programs found that K-8 students who attended summer school programs with teacher directed literacy lessons showed significant improvements in multiple areas including reading comprehension. Moreover, the effects were much larger for students from low-income backgrounds.

In sum, research generally suggests that summer school is needed and can be effective for at-risk students. Studies suggest that the effects of summer school are largest for elementary students when the programs emphasize reading and mathematics, and for high school students when programs focus on courses students failed during the school year. The more modest effects frequently found in middle school programs can be partially explained by the emphasis in many middle school summer school programs on adolescent development and self-efficacy, rather than academics.

Because summer school can produce powerful impacts, the EB model provides resources for summer school for classes of 15 students, for 50 percent of all free and reduced price lunch students in all grades K-12, an estimate of the number of students still struggling to meet academic requirements (Capizzano, Adelman & Stagner, 2002). The model provides resources for a program of eight weeks in length, class sizes of 15 students, and a six-hour day, which allows for four hours of instruction in core subjects. A six-hour day would also allow for two hours of non-academic activities. The formula would be one FTE position for every 30 free and reduced price lunch students or 3.33 per 100 such students. Because not all low income students

will need or will attend a summer school program, the EB model assumes 50 percent of the free and reduced-price lunch eligible pupils will attend the program – a need and participation figure identified by Kleiner, Nolin and Chapman (2004). As a result, providing resources at a rate of 1 FTE teacher to 30 free and reduced price lunch students produces class sizes of approximately 15 in summer school programs. Although a summer school term of six weeks will have fewer hours than five day a week extended day programs, we continue to fund this at the same rate to allow for teacher planning time for the summer school program – something that is less needed in extended day programs. Simplified, the EB summer school formula equates to 1 teacher position for every 120 free and reduced price lunch students.

However, in terms of a specific recommendation for summer school, we note that North Dakota already has an ambitious summer school program, calibrated at a pupil weight of 0.6 for each student enrolled in summer school. We have concluded North Dakota would be best served by retaining the current summer school program structure. We also would encourage the state to have districts focus summer school programs on students who need extra help to learn to standards, especially students in middle and high schools.

As the discussion to this point shows, the EB approach to overall staffing for most at-risk or disadvantaged students is a sequenced set of connected and structured programs that begin in the early elementary grades and continue through the upper elementary, middle and high school levels. For the most academically deficient educationally disadvantaged students, the EB model first provides one-to-one tutoring, and provides those who are not struggling as much intensive and explicit instruction in groups of three or five. For students who are still struggling to meet proficiency standards the EB model provides an extended day program that includes an academic focus, and that children needing even more help are then offered a summer school program that is structured and focused on academics – reading and mathematics for elementary and middle school students, and failed courses for high school students. Students who are both at-risk and ELL not only all receive these services but also receive ESL classes, which is discussed next.

9. English Language Learner (ELL) Students

Current North Dakota Policy	Evidence-Based Model
North Dakota currently provides additional resources for students for whom English is not their first language through a student weight for English language learning (ELL) students. The weight varies by the English proficiency of ELL students as follows: ELL level 1 weight is 0.3 ELL level 2 weight is 0.2 ELL level 3 weight is 0.07	One (1) FTE teacher position for every 100 identified ELL students. • For students who are both ELL and categorized as at-risk (eligible for free or reduced price lunch), the ELL resources are *in addition* to the resources in Elements 6, 7 and 8 above (tutoring, extended day, summer school) as well as additional pupil support (Element 14). These positions are also provided additional days for professional development (Element 19) and substitute days (Element 13) discussed below.

Analysis and evidence. Research, best practices and experience show that English language learners (ELL) need assistance to learn English, in addition to instruction in the regular content classes. This can include some combination of small classes, English as a second language classes, professional development for teachers to help them teach "sheltered English classes, and "reception" centers for districts with large numbers of ELL students who arrive as new immigrants to the country and the school throughout the year.

Good ELL programs work, whether the approach is structured English immersion (Clark, 2009) or initial instruction in the native language, often called bilingual education. However, bilingual education is difficult to provide in most schools because students come from so many different language backgrounds.

In a best-evidence synthesis of 17 studies on bilingual education, Slavin & Cheung (2005) found that ELL students in bilingual programs outperformed their non-bilingual program peers. Using studies focused primarily on reading achievement, the authors found an effect size of +0.45 for ELL students. A more recent *randomized controlled trial* also produced strong positive effects for bilingual education programs (Slavin, et al., 2011), but concluded that the language of instruction is less important than the approaches taken to teach reading.

In *The Elementary School Journal,* Gersten (2006) concludes that ELL students can be taught to read in English if, as shown for monolingual students, the instruction covers phonemic awareness, decoding, fluency, vocabulary and reading comprehension. Gersten's studies also showed that ELL students benefit from instructional interventions initially designed for monolingual English speaking students, the resources for which are included above.

Beyond the provision of additional teachers to provide English as a second language instruction to students who need that help, research shows that ELL students need a solid and rigorous core curriculum as the basis from which to provide any extra services (Gandara & Rumberger, 2008; Gandara, Rumberger, Maxwell-Jolly, & Callahan, 2003). This research suggests that ELL students need:

- Effective teachers – a core goal of all the staffing in this chapter
- Adequate instructional materials (Element 21) and good school conditions
- Good assessments of ELL students so teachers know in detail their English language reading and other academic skills (Element 21)
- Less segregation of ELL students
- Rigorous and effective curriculum and courses for all ELL students, including college and career ready, and affirmative counseling of such students to take those courses
- Professional development for all teachers, focusing on sheltered English teaching skills, (Element 19)

Hakuta (2011) supports these conclusions but also notes that English language learning takes time (one reason the EB model includes the above resources for every grade level) and that "academic language" is critical to learning the new Common Core Standards. The new standards require more explicit and coherent ELL instructional strategies and extra help services if these are to be effective at ensuring that ELL students learn the subject matter, English generally, and academic English specifically.

Additional staff are needed to provide English as a Second Language (ESL) instruction during the regular school day, such as having ELL students take ESL in lieu of an elective course. Although the potential to eliminate some elective classes exists if there are large numbers of ELL students who need to be pulled out of individual classrooms, it is generally agreed that to fully staff a strong ELL program each 100 ELL students should trigger one additional FTE teaching position. This makes it possible to establish pullout classes for ELL students and give them an additional dose of English instruction. The goal of this programming is to reinforce ELL student learning of academic content and English so at some point the students can continue their schooling in English only.

Research shows that it is the Limited English proficient, or English language learners (ELL), from lower income and generally less educated backgrounds who struggle most in school and need extra help to learn both academics and English. We address this need by providing ELL resources *in addition* to tutoring, extended day and summer school resources (Elements 6-8), as well as the additional pupil support staff (Element 14).

For example, a school with 125 students who qualify for free and reduced price lunch (or some alternative measure of low income students) and no ELL students would receive 1.0 tutor position. But if the 125 low-income children were all ELL students, the school would receive an additional 1.0 teacher position – in addition to the 1.0 tutor and any extended day, summer school and pupil support resources.

Given these realities, it is more appropriate to view the EB approach to extra resources for ELL students as including both resources for students from lower income backgrounds and ESL specific resources (Jimenez-Castellanos & Topper, 2012). Nevertheless, the North Dakota ELL weights are more generous than the EB approach and the state might prefer to retain its current approach to ELL students.

The North Dakota Professional Judgment Panels in 2008 noted that some districts in North Dakota are enrolling students who are new immigrants, often without either English language skills or prior experience in school. For these students, districts organize classes with from 5-10 newly arrived ELL students and one teacher, and over the course of a school year can gradually transition such students into regular classes. We have found similarly staffed programs for new immigrant students in other districts around the country.

Whatever specific weight for ELL students, the overall recommendations for most at-risk students is a sequenced set of connected and structured programs that begin in the early elementary grades and continue through the upper elementary, middle and high school levels. We propose that the most academically deficient at-risk students receive one-to-one tutoring, that the next group receive intensive and explicit instruction in groups of three or five, that students still struggling to meet proficiency standards then receive an extended day program that includes an academic focus, and that children needing even more help then be offered a summer school program that is also structured and focused on academics, i.e., reading and mathematics for elementary and middle school students, and failed courses for high school students. We also recommend additional pupil support services for at-risk students as described below.

10. Special Education

Current North Dakota Policy	Evidence-Based Model
North Dakota supports the extra costs districts incur for providing additional services to students with disabilities with a "census" approach for the high incidence and lower cost students, and full state funding for students with severe and profound disabilities. Specifically, the state provides a weight of 0.082 for each ADM to trigger the additional census based resources for special education students in the high incidence and lower cost category, and has a separate funding pool for the highest cost 1 percent of students with severe and profound disabilities. The state high cost risk pool/student contract program seeks to provide for 100 percent of the extra costs for students with severe and profound disabilities whose costs exceed average costs by a factor of 4.0. It should be noted that the weight of 0.082 has been rising for the past several years, and was just 0.067 in 2008, and that the multiplier for the high cost program was reduced from 4.5 to 4.0 in 2011.	A census approach to funding special education services for students with disabilities in the high incidence/lower cost categories. • One (1.0) teacher and 1.0 aide positions for every 150 regular students. This results in three teacher and 3 aide positions for each of the 450-student prototypical elementary and middle school, and 4 teacher and 4.0 aide positions for the 600-student prototypical high school. The EB Model includes the state reimbursing districts for 100 percent of the costs for the severely disabled, minus Federal Title VIb funds for such students. The $7,293 figure included the above teacher and aide positions for the "census" portion of special education funding.

Analysis and evidence. Providing appropriate education services for students with disabilities, while containing costs and avoiding over-identification of students, particularly minority students, presents several challenges (see Levenson, 2012). Many mild and moderate disabilities, particularly those associated with students learning to read, are correctable through strategic early intervention, including the kinds of effective core instruction and targeted intervention programs, particularly one-to-one tutoring, discussed above (Element 6).

In their newest book on the best approaches to serve students with disabilities, Frattura and Capper (2007) conclude that both research and most leading educators recommend that educating students in general education environments results in higher academic achievement and more positive social outcomes for students with and without disability labels as well as being the most cost effective way to educate students. Thus, they recommend that school leaders focus their efforts on preventing student underachievement and alter how students who struggle are educated; doing so, they argue, will overcome the costly and low performance outcomes of multiple pull-out programs. Further, fewer students will be inappropriately labeled with a disability, more students will be educated in heterogeneous learning environments, and higher student achievement and a more equitable distribution of achievement will result (Frattura & Capper, 2007).

The core principles of such a proactive approach to teaching students with a disability are that the education system needs to adapt to the student; that the primary aim of teaching and learning is the prevention of student failure, that the aim of all educators is to build teacher capacity, that all services must be grounded in the core teaching and learning of the school, and that to accomplish this, students must be educated alongside their peers in integrated environments (Frattura & Capper, 2007).

Indeed, research shows that many mild and moderate disabilities, particularly those associated with students learning to read, are correctable through intensive early intervention. For example, several studies (e.g., Borman & Hewes, 2003; Landry, 1999; Slavin, 1996) have documented that through a series of intensive instructional interventions (e.g. small classes, rigorous reading curriculum, 1-1 tutoring), nearly 75 percent of struggling readers identified in kindergarten and grade 1 can be brought up to grade level without the need for placement in special education. Other studies have noted decreases in disability labeling of up to 50 percent (see for example, Levenson, 2011; Madden, Slavin, Karweit, Dolan & Wasik, 1993; Slavin, 1996) with interventions of this type. That is why our previous recommendations for extended learning opportunities are so important; they are the series of service strategies that can be deployed before special education services are needed. This sounds like a common sense approach that would be second nature to educators, but in many cases educators have heretofore been rooted in a "categorical culture" that must be corrected through staff development and strong leadership from the district office and the site principal. Using a census approach to providing the bulk of extra resources for students with disabilities, the current North Dakota approach and the approach emerging across the country works best for students with mild and moderate disabilities but only if a functional, collaborative early intervention model (as outlined above) also is implemented.

This proactive approach to special education is evident in the Individuals with Disabilities Education Act (IDEA) of 2004, which changed the law about identifying children with specific learning disabilities. The reauthorized law states that schools will "not be required to take into consideration whether a child has a severe discrepancy between achievement and intellectual ability ..." (Section 1414(b)). Instead, in the Commentary and Explanation to the proposed special education regulations, the U.S. Department Education encourages states and school districts to abandon the IQ-achievement discrepancy model and adopt Response to Intervention (RTI) models, also discussed above, based on recent research findings (Donovan & Cross, 2002; Lyon et al., 2001; President's Commission on Excellence in Special Education, 2002; Stuebing et al., 2002). An RTI model, what we call a proactive approach above, identifies students who are not achieving at the same level and rate as their peers and provides appropriate interventions, the first ones of which should be part of the "regular" school program and not funded with special education resources (Mellard, 2004). The core features of RTI include: high quality classroom instruction, research-based instruction, classroom performance, universal screening, continuous progress monitoring, research-based interventions, progress monitoring during interventions, and fidelity measures (Mellard, 2004). Common attributes of RTI implementations are: a strong core instructional program for all students, multiple tiers of increasingly intense student interventions, implementation of a differentiated curriculum, instruction delivered by staff other than the classroom teacher, varied duration, frequency, and

time of interventions, and categorical or non-categorical placement decisions (Mellard, 2004). This proactive model fits seamlessly into our broader approach to helping all struggling students through early interventions.

In many instances this approach requires school-level staff to change their practice and cease functioning in "silos" that serve children in "pull-out" programs identified by funding source for the staff member providing the services (e.g. General Fund, Special Education, Title I). Instead, all staff would team closely with the regular classroom teacher to identify deficits and work together to correct them as quickly as possible. This is a common sense approach that could be second nature in schools, but in many cases schools have heretofore been rooted in a "categorical culture" that must be corrected through professional development and strong leadership from the district office and the site principal.

Allocating a fixed census level of staffing (3.0 FTE teachers and 1.5 FTE aides) for an elementary school of 450 students) can meet the needs of children with mild and moderate disabilities if a functional, collaborative early intervention model such as the one outlined above can be implemented. We note that our staffing for the preceding programs for at-risk students meets this requirement – tutoring, extended day, summer school and ELL.

For children with more severe disabilities, clustering them in specific schools to achieve economies of scale is generally the most effective strategy and provides the greatest opportunity to find ways to mainstream them (to the extent feasible) with regular education students. In very sparsely populated areas this is often not feasible but should be explored. Students in these categories generally include: severely emotionally disturbed (ED); severely mentally and/or physically handicapped; and children within the autism spectrum. The ED and autism populations have been increasing dramatically across the country, and it is likely that this trend will continue in the future. To make the provision of services to these children cost-effective, it makes sense to explore clustering of services where possible and design cost parameters for clustered services in each category. In cases where students need to be served individually or in groups of two or three because of geographic isolation, it would be helpful to cost out service models for those configurations as well, but provide full state funding for those children. This strategy would reduce the likelihood of overwhelming the financial capacity of a small school district that happens to be the home of a child with a severe disability.

To implement these approaches to services for students with disabilities, states like North Dakota, among others, have begun to fund special education services using the "census" approach. The census approach, which can be simply funded by providing additional teacher resources for prototypical schools, assumes the incidence of these categories of disabilities is approximately equal across districts and schools and includes resources for providing needed services at an equal rate for all schools and districts. The census approach has emerged across the country for several reasons:

- The continued rise in the number and percentage of "learning disabled" and continued questioning by some of the validity of these numbers
- Under-funding of the costs of severely disabled students

- Over labeling of poor, minority, and ELL students into special education categories, which often leads to lower curriculum expectations, and inappropriate instructional services
- Reduction of paper work

Often, the census approach for the high incidence, lower cost students with disabilities is combined with a different strategy for the low-incidence, high-need students, whose costs are funded separately and totally by the state, as these students are not found proportionately in all districts. For example, California approved a census-funding system, in part because many felt the old system created too many fiscal incentives to identify students as needing special education, and in part to improve the equity of the distribution of state aid for special education. Other reasons included the desire to give the local districts more flexibility while holding them accountable, and having a system that was easy to understand.

Today, diverse states such as Alabama, Arkansas, California, Montana, North Dakota, Pennsylvania, and the New England states of Massachusetts and Vermont all use census-based special-education funding systems. Moreover, all current and future increases in federal funding for disabled students are to be distributed on a census basis.

North Dakota funds 100 percent of the costs of "high cost" special education programs, defined as costs that exceed average costs by a factor of 4.0. In 2011, that factor was reduced from 4.5 to the 4.0 level. The state should continue to monitor the degree to which this definition of high cost still works.

The Parrish and Harr (2006) report on Special Education funding in North Dakota suggested several additional more detailed changes in the state's approach to funding special education services, particularly for the high cost/contract students. We would encourage the state to consider those recommendations as it further tailors it special education funding in the future.

11. Alternative Schools

Current North Dakota Policy	Evidence-Based Model
North Dakota provides an extra weight of 0.25. for students in Alternative High Schools and an extra weight of 0.15 for students in Alternative Middle Schools (grades 6-8). Such schools are for students who have dropped out of school, and are not included in the regular ADM count. The count of alternative school students is determined by the number of days attended, as "other ADM," and is proportionately reduced if the student takes fewer than 4 courses.	The Evidence-Based model provides 1 assistant principal position plus 1 teacher position for every 7 FTE students in an alternative school program, as well as the dollar per pupil resources (instructional materials, technology, etc.) and Central Office and Maintenance and Operations. This staffing ratio applies to students from whatever grade level.

Analysis and evidence. A small number of students have difficulty learning in the traditional school environment. The students this report address are those that also have some combination of significant behavioral, social and emotional issues, often including alcohol or drug addictions. Such students often do much better in *small* "alternative learning environments." Some North Dakota school districts have various versions of "alternative schools" for such students, currently financed by the weight of 0.25 for all high school students and 0.15 for all middle school students in such programs. Our view is that North Dakota should continue the tradition of Alternative Schools. However, we note that this section does not consider Alternative Schools for students who simply prefer a different approach to learning academics, such as project-based learning, or more applied learning strategies that can be deployed in new career technical programs such as computer assisted engineering, etc. Our concept of Alternative Schools is for "troubled" youth who need counseling and therapy embedded in the school's instructional program.

From our work in other states, we have found that funding formulas for alternative schools differ substantially. In a few states, the typical staffing ratio for an alternative school is one administrative position for the school plus one teacher position for every eight students. Because alternative high schools are generally designed to serve students who are severely at risk, we recommend they remain relatively small. As a result of the small size of alternative schools, staff at these schools often must fill multiple roles. Many teachers in alternative schools provide many different services for students, including: instruction, pupil support, and counseling services. This suggests that the staffing structure and organization for instruction in Alternative High Schools is usually quite different from that found in typical high schools.

At the Professional Judgment Panels we organized in 2008, several individuals described the typical staffing for "major alternative schools" in North Dakota. For a group of about 100 students, the schools generally had a lead administrator, a secretary, and one professional staff for every 10 students. This is somewhat fewer staff than the EB formula of one AP position (a lead administrator) and one teacher position for every 7 students.

One of the major issues states face in creating funding programs for alternative schools is defining them. A review of literature and state practice on alternative education provides little guidance for developing a clear definition of alternative education. Perhaps the best we were able to identify was from the Urban Institute (Aron, 2006), which defined alternative education as:

> Alternative education refers to schools or programs that are set up by states, school districts, or other entities to serve young people who are not succeeding in a traditional public school environment. Alternative education programs offer students who are failing academically or may have learning disabilities, behavioral problems, or poor attendance an opportunity to achieve in a different setting and use different and innovative learning methods. While there are many different kinds of alternative schools and programs, they are often characterized by their flexible schedules, smaller teacher-student ratios, and modified curricula.

We also reviewed state standards – where such existed – for alternative schools. Most states use definitions similar to that of the Urban Institute, but we only identified on state, Indiana that actually established standards for what an alternative education program might look like. The Indiana Department of Education's (2010) web site states that:

> While each of Indiana's alternative education programs is unique, they share characteristics identified in the research as common to successful alternative schools.
> - Maximum teacher/student ratio of 1:15
> - Small student base
> - Clearly stated mission and discipline code
> - Caring faculty with continual staff development
> - School staff having high expectations for student achievement
> - Learning program specific to the student's expectations and learning style
> - Flexible school schedule with community involvement and support
> - Total commitment to have each student be a success

The Institute for Education Sciences at the U.S. Department of Education published some statistics on Alternative Schools and Programs for the 2007-08 school year (Carver & Lewis, 2010). That study identified 558,300 students in 10,300 district administered alternative education schools and programs across the United States. Although the report did not provide data on the size of these schools or on staffing ratios, the data above suggest an average alternative school size of 54 students. Most of the programs served students in grades 9-12. The main reasons students were enrolled in alternative programs – all of which meet our initial definition of severe emotional and/or behavioral problems – included:

- Possession or use of firearms or other weapons
- Possession, distribution, or use of alcohol or drugs
- Arrest or involvement with the criminal justice system
- Physical attacks or fights
- Disruptive verbal behavior
- Chronic truancy

- Continual academic failure
- Pregnancy/teen parenthood
- Mental health needs

We will revisit the issue of Alternative schools in the spring when we address all the weights in North Dakota's school finance formula. Here we note two items. First the EB approach would provide similar funding for all alternative schools, whether they were middle or high schools, though few states have formal alternative middle school programs. Second, since the state retained the 0.25 weight for alternative high schools when it shifted to a much higher foundation expenditure level (in the past, the 0.25 weight was applied to the Per Student Payment which was about half the current foundation expenditure level), the weight now provides significantly more funds for such programs, and could be an inducement for districts to expand alternative school programming beyond initial intent. Thus, the state should monitor the evolution of alternative school programs to ensure that all retain the intent of current regulations, which do note requires the Department of Public Instruction to approve all alternative education programs.

12. Gifted and Talented Students[3]

Current North Dakota Policy	Evidence-Based Model
Current North Dakota Policy under Section 7 of the Department's appropriations bill authorizes $800,000 for Gifted and Talented programs upon submission of an application that is approved in accordance with guidelines adopted by the Department. Districts can provide services for such students but from regular, general fund resources.	Resources for gifted and talented students are provided at a rate of $25 per regular pupil. The $7,293 figure included this element.

Analysis and evidence. A complete analysis of educational adequacy should include the gifted, talented, and able and ambitious students, most of who perform above state proficiency standards. This is important for all states whose citizens desire improved performance for students at all levels of achievement. Research shows that developing the potential of gifted and talented students requires:

- Effort to discover the hidden talent of low income and/or culturally diverse students
- Curriculum materials designed specifically to meet the needs of talented learners
- Acceleration of the curriculum
- Special training in how teachers can work effectively with talented learners.

Discovering hidden talents in low-income and/or culturally diverse high ability learners. Research studies on the use of performance assessments, nonverbal measures, open-ended tasks, extended try-out and transitional periods, and inclusive definitions and policies produce increased and more equitable identification practices for high ability culturally diverse and/or low-income learners. Access to specialized services for talented learners in the elementary years is especially important for increased achievement among vulnerable students. For example, high-ability, culturally-diverse learners who participated in three or more years of specialized elementary and/or middle school programming had higher achievement at high school graduation, as well as other measures of school achievement, than a comparable group of high ability students who did not participate (Struck, 2003).

Access to curriculum. Overall, research shows that curriculum programs specifically designed for talented learners produce greater learning than regular academic programs. Increased complexity of the curricular material is a key factor (Robinson & Clinkenbeard, 1998). Large-scale curriculum projects in science and mathematics in the 1960s, such as the Biological Sciences Curriculum Study (BCSC), the Physical Science Study Committee (PSSC), and the Chemical Bond Approach (CBA), benefited academically talented learners (Gallagher, 2002). Further, curriculum projects in the 1990s designed to increase the achievement of talented learners in core content areas such as language arts, science, and social studies produced academic gains in persuasive writing and literary analysis (VanTassel-Baska, Johnson, Hughes

[3] This section is based on an unpublished literature review written by Dr. Ann Robinson, Professor, University of Arkansas at Little Rock.

& Boyce, 1996; VanTassell-Baska, Zuo, Avery & Little, 2002), scientific understanding of variables (VanTassel-Baska, Bass, Ries, Poland & Avery, 1998), and problem generation and social studies content acquisition (Gallagher & Stepien, 1996; Gallagher, Stepien & Rosenthal, 1992).

Access to acceleration. Because academically talented students learn quickly, one effective option for serving them is acceleration of the curriculum. Many educators and members of the general public believe acceleration always means skipping a grade. However, there are at least 17 different types of acceleration ranging from curriculum compacting (which reduces the amount of time students spend on material) to subject matter acceleration (going to a higher grade level for one class) to high school course options like Advanced Placement or concurrent credit (Southern, Jones & Stanley, 1993). In some cases, acceleration means *content* acceleration, which brings more complex material to the student at his or her current grade level. In other cases, acceleration means *student* acceleration, which brings the student to the material by shifting placement. Reviews of the research on different forms of acceleration have been conducted across several decades and consistently report the positive effects of acceleration on student achievement (Gallagher, 1996; Kulik & Kulik, 1984; Southern, Jones & Stanley, 1993), including Advanced Placement classes (Bleske-Rechek, Lubinski & Benbow, 2004). Multiple studies also report participant satisfaction with acceleration and benign effects on social and psychological development.

Access to trained teachers. Research and teacher reports indicate that general classroom teachers make very few, if any, modifications for academically talented learners (Archambault, et al, 1993), even though talented students have mastered 40 to 50 percent of the elementary curriculum before the school year begins. In contrast, teachers who receive appropriate training are more likely to provide classroom instruction that meets the needs of talented learners. Students report differences among teachers who have had such training, and independent observers in the classroom document the benefit of this training as well (Hansen & Feldhusen, 1994). Curriculum and instructional adaptation requires the support of a specially trained coach at the building level, which could be embedded in the instructional coaches recommended above (Reis & Purcell, 1993). Overall, learning outcomes for high ability learners are increased when they have access to programs whose staff have specialized training in working with high ability learners, which could be accomplished with the professional development resources recommended below.

Overall, research on gifted programs indicates that the effects on student achievement vary by the strategy of the intervention. Enriched classes for gifted and talented produce effect sizes of about +0.40 and accelerated classes for gifted and talented students produce somewhat larger effectives sizes of +0.90 (Gallagher, 1996; Kulik & Kulik, 1984; Kulik & Kulik, 1992).

Practice implications. At the elementary and middle school level, our understanding of the research on best practices is to place gifted students in special classes comprised of all gifted students and accelerate their instruction because such students can learn much more in a given time period than other students. When the pull out and acceleration approach is not possible, an alternative is to have these students skip grades in order to be exposed to accelerated instruction. Research shows that neither of these practices systemically produces social adjustment problems.

Many gifted students get bored and sometimes restless in classrooms that do not have accelerated instruction. Both of these strategies have little or no cost, except for scheduling and training of teachers (which is covered in Professional Development Element 19).

The primary approach to serve gifted students in high schools is to enroll them in advanced courses – advanced placement (AP), International Baccalaureate (IB) – to participate in dual enrollment in postsecondary institutions, or to have them take courses through distance learning mechanisms.

We confirmed our understanding of best practices for the gifted and talented with the directors of three of the Gifted and Talented research centers in the United States: Dr. Elissa Brown, Director of the Center for Gifted Education, College of William & Mary; Dr. Joseph Renzulli, The National Research Center on the Gifted and Talented at the University of Connecticut; and Dr. Ann Robinson, Director of the Center for Gifted Education at the University of Arkansas at Little Rock.

The University of Connecticut center also agreed with these conclusions and has developed a very powerful Internet-based platform, Renzulli Learning, which could provide for a wide range of programs and services for gifted and talented students. This system takes students through about a 25-30 minute detailed assessment of their interests and abilities, which produces an individual profile for the student. The student is then directed, via a search engine, to 14 different Internet data systems, including interactive web-sites and simulations that provide a wide range of opportunities to engage the student's interests. Renzulli stated that such an approach was undoubtedly the future for the very bright student and could be supported by a grant of $25 per student in a district. Field (2007) found that after 16 weeks, students given access to an internet based program, such as Renzulli Learning to read, research, investigate, and produce materials, significantly improved their overall achievement in reading comprehension, reading fluency and social studies.

13. Substitute Teachers

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota education or school finance policy. It is a personnel resource that districts and schools buy with local and state equalization dollars through the general fund.	The EB model includes resources for substitute teachers at the ratio of 5 percent of all teacher and instructional facilitator positions (which provides about 10 days per teacher on a 192 day teacher year). The $7,293 figure included ten days, but priced at $125 per day, which was below the average daily rate.

Analysis and evidence. Schools need some level of substitute teacher allocations in order to cover classrooms when teachers are sick for one or two days, absent for other reasons, or on long term sick or pregnancy leave, etc. In many other states, substitute funds are provided at a rate of about ten days for all teachers, which is very close to providing an additional 5 percent of teachers for substitute services. This approach does not mean that each teacher is provided ten substitute days a year; it means the district needs a "pot" of money approximately equal to 10 substitute days per year for all teachers, in order to cover classrooms when teachers are sick for 1-2 days, absent for other reasons, on long term sick or pregnancy leave, etc. This allocation also is not for 10 days above what is currently provided; it simply is an amount of money for substitute teachers estimated at 10 days for each teacher on average. These substitute funds are not meant to provide for pupil free days for professional development; the professional development recommendations are fully developed in a separate section below.

14. Student Support/Family Outreach

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota school finance policy. It is a personnel resource that districts and schools can buy with local and state equalization dollars in the general fund. State accreditation standards, however, require a full-time, credentialed school counselor for every 300 students in grades 7-12, allowing 30 percent of those positions to be filled with career advisors.	Staffing ratios for prototypical schools are: • One (1) guidance counselor for every 450 elementary school students • One (1) guidance counselor for every 250 Grade 9-12 students. • One (1) nurse for every 750 students In addition for at-risk students, one (1) professional pupil support position for every 125 at risk, free and reduced price lunch students. These staffing provisions enable districts and schools to allocate FTE staff to serve as guidance counselors, nurses, psychologists, and social workers, in a way that best addresses student needs from the perspective of each district and school. The $7,293 figure included this element for each prototypical school, though the nurse is an addition.

Analysis and evidence. Schools need a student support and family outreach strategy. Various comprehensive school designs have suggested different ways to provide such a program strategy (Stringfield, Ross & Smith, 1996; for further discussion, see Brabeck, Walsh & Latta, 2003). In terms of level of resources, the more disadvantaged the student body, the more comprehensive the strategy needs to be. The general standard is one licensed professional for every 100 students from a low-income background, (modified in North Dakota by providing at least one pupil support position for each prototypical school and reducing the ratio to one FTE position for every 125 at risk students).

Although there are many ways schools can provide outreach to parents, or involve parents in school activities – from fund raisers to governance – research shows that school sponsored activities that impact achievement address what parents can do at home to help their children learn. For example, if the education system has clear content and performance standards, helping parents and students to understand both what needs to be learned and what constitutes acceptable standards for academic performance is helpful. Put succinctly, parent outreach that explicitly and directly addresses what parents can do to help their children learn, and to understand the standards of performance that the school expects, are the types of school-sponsored parent activities that produce discernible impacts on student's academic learning (Steinberg, 1997).

At the secondary level, the goal of such activities is to have parents learn about what they should expect of their children in terms of their learning and academic performance in high school. If a district or a state requires a minimum number of courses for graduation, that requirement should be made clear. If there are similar or more extensive course requirements for admission into state colleges and universities, those requirements should be addressed. If either average scores on end-of-course examinations or a cut-score on a comprehensive high school test are required for graduation, they too should be discussed. Secondary schools need to help many parents understand how to more effectively assist their children to find an academic pathway through middle and high school, understand standards for acceptable performance, and at the high school, be aware of the course work necessary for college entrance. This is particularly important for parents of students in the middle or lower end of the achievement, as often these students know very little of the requirements for transition from high school to post-secondary education (Kirst & Venezia, 2004).

At the elementary school level, the focus for parent outreach and involvement programs should concentrate on what parents can do at home to help their children learn academic work for school. Too often parent programs focus on fund raising through the parent-teacher organization, involvement in decision making through school site councils, or other non-academically focused activities at the school site. Although these school-sponsored parent activities might impact other goals – such as making parents feel more comfortable being at school or involving parents more in some school policies – they have little effect on student academic achievement. Parent actions that impact learning would include: 1) reading to them at young ages, 2) discussing stories and their meanings, 3) engaging in open ended conversations, 4) setting aside a place where homework can be done, and 5) ensuring that their child completes homework assignments.

The EB model uses the standards from the American School Counselor Association (ASCA), which is one counselor for every 250 secondary students. This produces 1.8 guidance counselor positions in the prototypical middle school and 2.4 guidance counselors in the prototypical high schools. Because most states also require a guidance counselor in elementary schools at about the size of our 450 student prototypical elementary school, the EB model also includes one guidance counselor at the level.

The EB model provides school nurses at the rate of 1 FTE nurse position for every 750 students, the staffing standard of the American School Nurse Association.

The EB model provides additional pupil support personnel to schools on the basis of free and reduced price lunch counts, an indicator of more non-academic support help. The EB model provides one professional pupil support position for every 125 students eligible for free and reduced price lunch, in addition to the above counselor and nurse staff.

These staffing provisions enable districts and schools to allocate FTE staff to serve as guidance counselors, nurses, psychologists, and social workers, in a way that best addresses student needs from the perspective of each district and school.

Readers should note that this recommendation provides substantial and adequate resources for parent outreach and involvement, as well as counseling for students. For an all poverty school, our recommendations would provide 3.6 staff positions for an elementary school of 450 students (so it could have a nurse, counselor, social worker and parent liaison team) and the same ratio of staff at the middle and high school levels plus an *additional* 1.0 counselor at the prototypical elementary school, 1.8 additional counselors at the middle school and 2.4 additional counselors at the prototypical high school.

The resources are adequate to create and deploy the ambitious and comprehensive parent involvement and outreach programs that are part of two comprehensive school designs: Success for All and the Comer School Development Program. The Success for All program would include a family outreach coordinator, a nurse, social worker, guidance counselor and education diagnostician. This group would function as a parent outreach team for the school, would serve as case managers for students who needed non-academic and social services, and usually also include a clothing strategy to ensure that all students, especially in cold climates, had sufficient and adequate clothes, and coats, to attend school.

The Comer Program is created on the premise of connecting schools more to their communities. Its Parent-School team would have a somewhat different composition and would be focused on training parents to raise expectations for their children's learning, to work with social service agencies and sometimes to even co-locate on school site premises the provision of a host of social services, and to work with the school's faculty to raise their expectations for what students can learn.

We support the state's allowing high schools to allocate a portion of their guidance counselor allocations, such as up to 30 percent of the counseling positions allocated in the model, to individuals who would provide career counseling and advising services, with the stipulation that such individuals would need training or "certification" in career counseling and advising, but not necessarily a guidance counselor license.

15. Aides

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota education or school finance policy. It is a personnel resource that districts and schools can buy with local and state equalization dollars in the general fund.	Staffing ratios are: • One (1) FTE supervisory aide position for every 225 elementary and middle school students • One (1) FTE supervisory aide position for every 200 high school students. The $7,293 figure included this element.

Analysis and evidence. Elementary, middle and high schools need staff for responsibilities that include lunch duty, before and after school playground supervision, bus duty, and others. Covering these duties generally requires an allocation of supervisory aides at about the rate of 2.0 FTE aide positions for a school of 400-500 students.

However, research does not support the use of instructional aides for improving student performance. As noted above (Element 3), the Tennessee STAR study, which produced solid evidence through field-based randomized trails that small classes work in elementary schools, also produced evidence that instructional aides in schools do not add value, *i.e.*, do not positively impact student academic achievement (Gerber, Finn, Achilles & Boyd-Zaharias, 2001).

At the same time, districts may want to consider a possible use of instructional aides that is supported by research. There are two studies that show how instructional aides could be used to tutor students. Farkas (1998) has shown that if aides are selected according to clear and rigorous literacy criteria, are trained in a specific reading tutoring program, provide individual tutoring to students in reading, and are supervised, then they can have a significant impact on student reading attainment. Some districts have used Farkas-type tutors for students still struggling in reading in the upper elementary grades. Another study by Miller (2003) showed that such aides could also have an impact on reading achievement if used to provide individual tutoring to struggling students in the first grade.

We should note that neither of these studies supports the typical use of instructional aides as teacher helpers. Evidence shows that instructional aides can have an impact but only if they are selected according to educational criteria, trained in a specific tutoring program, deployed to provide tutoring to struggling students, and closely supervised.

The EB Model provides two (2) FTE supervisory aide positions for the prototypical elementary and middle school and three (3) FTE supervisory aide positions for the prototypical high school, to be used for relieving teachers from lunchroom, playground and other non-teaching responsibilities.

16. Librarians

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota education or school finance policy. It is a personnel resource that districts and schools can buy with local and state equalization dollars in the general fund. Accreditation standards require a full time librarian for every 450 students.	Staffing ratios are: • One (1) librarian for every 450 student elementary and middle school. • One (1) librarian for every 600 student high school (This might need to be augmented given the state's accreditation standards.) The $7,293 figure included this element.

Analysis and evidence. Most schools have a library, and the staff resources must be sufficient to operate the library and to incorporate appropriate technologies into the library system. Further, some elementary librarians could teach students for some of the day as part of special subject offerings.

The EB Model recommendation for library staff is derived from best practices, practice in other states, as well as state statutes where they exist.

17. Principals and Assistant Principals

Current North Dakota Policy	Evidence-Based Model
Principals are a personnel resource that districts and schools can buy with local and state equalization dollars in the general fund. In part because of the multiplicity of small schools in North Dakota, the accreditation standards have several provisions regarding principals. High schools with enrollments of 250 or more students must have a full time principal, who can spend a maximum of one-sixth of the day in instructional activities. High schools with from 101 to 250 students must have at least a two-thirds principal. A high school with 501 to 750 students must have a half time assistant principal, and high schools with more than 750 students must have full time assistant principals. Middle schools with 101 to 250 students must have a 2/3 time principal, and middle schools with more than 250 students must have a full time principal. A middle school with 501 to 750 students must have a half time assistant principal, and middle schools with more than 750 students must have full time assistant principals. Elementary schools with 101 to 250 students must have a 2/3 time principal; elementary schools with more than 250 students must have a full time principal. Elementary schools with more than 600 students must have at least a half time assistant principal.	Staffing ratios are: • One (1) principal for every 450 student elementary and middle school • One (1) principal for every 600 student high school • One (1) assistant principal for every 900 middle school students and every 600 high school students. The $7,293 figure included this element; the 0.5 assistant principal position for middle schools was added to meet the state's accreditation standards.

Analysis and evidence. Every school unit needs a principal. There is no research evidence on the performance of schools with or without a principal. The fact is that essentially all schools in America, if not the world, have a principal. All comprehensive school designs, and all prototypical school designs from all professional judgment studies around the country, include a principal for every school unit. However, few if any comprehensive school designs include assistant principal positions. And very few school systems around the country provide assistant principals to schools with 500 students or less. Since we also recommend that instead of one school with a large number of students, school buildings with large numbers of students be sub-divided into multiple school units within the building, we recommend that each unit have a principal. This implies that one principal would be required for each school unit. The model provides 1 assistant principal for the high school largely for discipline and athletics.

18. School Site Secretarial Staff

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota education or school finance policy. It is a personnel resource that districts and schools can buy with local and state equalization dollars in the general fund.	Staffing ratios are: • Two (2) FTE school clerical positions for every 450 student elementary and middle school • Three (3) FTE school clerical positions for every 600 student high school. The $7,293 figure included this element.

Analysis and evidence. Every school site needs secretarial support to provide clerical and administrative assistance support to administrators and teachers, to answer the telephone, greet parents when they visit the school, help with paper work, etc. Our secretarial ratios derive from common practices across the country.

RECOMMENDATIONS FOR THE DOLLAR PER PUPIL ELEMENTS

This section addresses areas that are funded by dollar per pupil amounts, including professional development, instructional materials and supplies, computers and other technology, etc.

19. Intensive Professional Development

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for professional development funding in North Dakota education or school finance policy. It is an educational strategy that districts and schools can buy with local and state equalization dollars in the general fund, or with federal funds. However, there is increasing use of Regional Service Agencies as a mechanism for delivering effective professional development services.	The EB model includes the following: • 10 days of pupil free time for training, which is an increase of approximately 8 days in North Dakota • Funds for training at the rate of $100 per pupil These resources are in addition to: • Instructional Coaches (Element 3) • Collaborative work with teachers in their schools during planning and collaborative time periods (Element 2). The $7,293 figure included these elements.

Analysis and evidence. All school faculties need ongoing professional development. Improving teacher effectiveness through high quality professional development is arguably as important as all of the other resource strategies identified. Effective teachers are the most influential factor in student learning (Rowan, Correnti & Miller, 2002; Wright, Horn & Sanders, 1997) and more systemic deployment of effective instruction is key to improving learning and reducing achievement gaps (Odden, 2011a; Raudenbusch, 2009).

An ongoing, comprehensive and systemic professional development program is the way in which all the resources recommended in this report are transformed into high quality instruction that increases student learning. Further, though the key focus of professional development is for better instruction in the core subjects of mathematics, reading/language arts, history and science, the professional development resources by the EB model are adequate to address the instructional needs for gifted and talented and English language learning students, for embedding technology in the curriculum, and for elective teachers as well. Finally, all beginning teachers need intensive professional development, first in classroom management, organization and student discipline, and then in instruction. And the most effective way to "induct" and "mentor" new teachers is to have them working in functional collaborative teacher teams.

Fortunately, there is recent and substantial research on effective professional development and its costs (e.g., Crow, 2011; Odden, 2011b). Effective professional development is defined as professional development that produces change in teachers' classroom-based instructional

practice that can be linked to improvements in student learning. The practices and principles researchers and professional development organizations use to characterize "high quality" or "effective" professional development draw upon a series of empirical research studies that linked program strategies to changes in teachers' instructional practice and subsequent increases in student achievement. Combined, these studies and recent reports from Learning Forward, the national organization focused on professional development (see Crow, 2011), identified six structural features of effective professional development:

- The *form* of the activity – that is, whether the activity is organized as a study group, teacher network, mentoring collaborative, committee or curriculum development group. The above research suggests that effective professional development should be school-based, job-embedded and focused on the curriculum taught rather than a one-day workshop.
- The *duration* of the activity, including the total number of contact hours that participants are expected to spend in the activity, as well as the span of time over which the activity takes place. The above research has shown the importance of continuous, ongoing, long-term professional development that totals a substantial number of hours each year, at least 100 hours and closer to 200 hours.
- The degree to which the activity emphasizes the *collective participation* of teachers from the same school, department, or grade level. The above research suggests that effective professional development should be organized around groups of teachers from a school that over time includes the entire faculty
- The degree to which the activity has a *content focus* – that is, the degree to which the activity is focused on improving and deepening teachers' content knowledge as well as how students learn that content. The above research concludes that teachers need to know well the content they teach, need to know common student miscues or problems students typically have learning that content, and effective instructional strategies linking the two.
- The extent to which the activity offers opportunities for *active learning*, such as opportunities for teachers to become engaged in the meaningful analysis of teaching and learning; for example, by scoring student work or developing, refining and implementing a standards-based curriculum unit. The above research has shown that professional development is most effective when it includes opportunities for teachers to work directly on incorporating the new techniques into their instructional practice with the help of instructional coaches (see also Joyce & Showers, 2002).
- The degree to which the activity promotes *coherence* in teachers' professional development, by aligning professional development to other key parts of the education system such as student content and performance standards, teacher evaluation, school and district goals, and the development of a professional community. The above research supports tying professional development to a comprehensive, inter-related change process focused on improving student learning.

Form, duration, and active learning together imply that effective professional development includes some initial learning (*e.g*. a two-week – 10 day – summer training institute) as well as considerable longer-term work in which teachers incorporate the new methodologies into their actual classroom practice. Active learning implies some degree of collaborative work and coaching during regular school hours to help the teacher incorporate new strategies in his/her

normal instructional practices. It should be clear that the longer the duration, and the more the coaching, the more time is required of teachers as well as professional development trainers and coaches.

Content focus means that effective professional development focuses largely on subject matter knowledge, what is known about how students learn that subject, and the actual curriculum that is used to teach this content. Today this would mean a focus on the Common Core standards and other curriculum programs designed to ensure all students are college and career ready when the graduate from high school. Collective participation implies that the best professional development includes groups of and at some point all teachers in a school, who then work together to implement the new strategies, engage in data-based decision making (Carlson, Borman & Robinson, 2011) and in the process, help build a professional school community.

Coherence suggests that the professional development is more effective when the signals from the policy environment (federal, state, district, and school) reinforce rather than contradict one another or send multiple, confusing messages. Coherence also implies that professional development opportunities should be given as part of implementation of new curriculum and instructional approaches, today focusing on the Common Core curriculum. Note that there is little support in this research for the development of individually oriented professional development plans; the research implies a much more systemic approach.

Each of these six structural features has cost implications. Form, duration, collective participation, and active learning require various amounts of both teacher and trainer/coach/mentor time, during the regular school day and year and, depending on the specific strategies, outside of the regular day and year as well. This time costs money. Further, all professional development strategies require some amount of administration, materials and supplies, and miscellaneous financial support for travel and fees. Both the above programmatic features and the specifics of their cost implications are helpful to comprehensively describe specific professional development programs and their related resource needs.

From this research on the features of effective professional development, the EB model includes the following for a systemic, ongoing, comprehensive professional development program:

- 10 days of pupil free time for training
- Funds for training at the rate of $100 per pupil

These resources are in addition to:

- Instructional coaches (Element 3)
- Collaborative work with teachers in their schools during planning and collaborative time periods (Element 2)

As a cautionary note, we have found in other states that when resources for instructional coaches are included in the general aid program, districts often do not use those resources to hire instructional coaches. Many individuals in our 2008 Professional Judgment panels suggested that instructional coach funds should be separated into a “categorical” program or stipulations created that would require districts to hire their allocation of instructional coaches. We would concur with the general sentiment of these suggestions.

20. Technology and Equipment

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such resources in North Dakota education or school finance policy. It is a resource that districts and schools can buy with local and state equalization dollars in the general fund. But given the increasing importance of computer and other information related technologies to the world of work and for access to education and training provided by distance learning, internet-based strategies and other electronic means, equipping schools with adequate technology and related equipment could be very important to the future success of K-12 education in North Dakota.	The EB model provides: • $250 per every K-12 student The $7,293 figure included this element.

Analysis and evidence. Over time, schools need to embed technology in instructional programs and school management strategies. Today, more and more states are requiring students not only to be technologically proficient but also to take some courses online in order to graduate from high school. Further, there are many online education options, from state-run virtual schools such as those in Florida and Wisconsin, to those created by private sector companies who run many virtual charter schools, such as K12 Inc. and Connections Academy. "Blended instructional" models, such as Rocketship, have also emerged. These programs infuse technology and online teaching into regular schools, provide more 1-1 student assistance, and put the teacher into more of a coaching role (see Odden, 2012). Research also shows that these technology systems work very well for many students, and can work very effectively in schools with high concentrations of lower income and minority students. Moreover, they are often less costly than traditional public schools (Battaglino, Haldeman & Laurans, 2012; Odden, 2012).

Infusing technology into the school curriculum has associated costs for computer hardware, networking equipment, software, training and personnel associated with maintaining and repairing these machines.

- The *Total Cost* of purchasing and embedding technology into the operation of schools identifies both the direct and indirect costs of technology and its successful implementation.
    - The *direct costs* of technology include hardware, software, and labor costs for repairing and maintaining the machines.
    - *Indirect costs* include the costs of users supporting each other, time spent in training classes, casual learning, self-support, user application development and downtime costs.

This Element (20) identifies only direct technology costs, as the indirect costs, which are primarily training, are included in the overall professional development resources (Element 19).

Districts also need individuals to serve as technical support for technology embedded curriculum and management systems (Element 5), though the bulk of that work can be covered by warranties purchased at the time computers are acquired.

In estimating the direct costs of purchasing, upgrading, and maintaining computer hardware, the software that helps these computers to function, and the networks on which they run, the EB approach recognizes the fact that today virtually no school is beginning at a baseline of zero. All schools have a variety of computers of varying ages, the large majority of which are connected to school networks and the Internet. Unlike the 1990's when expensive projects had to retrofit schools with data networks, the following cost estimates identifies resources needed to maintain and enhance the technology base that exists in schools. Moreover, as should be clear, these are ongoing and not one-off costs.

We also note that each district and school situation is unique, requiring that an individual technology plan be created at both district and school levels. Most districts and schools have technology plans because of the federal funding requirements in the E-Rate and EETT programs. These documents should be meaningful mechanisms used to allocate resources to the areas of most need within the school or district environment.

We refer readers to more detailed analysis of the costs of equipping schools with ongoing technology materials (Odden, 2012) that was spearheaded by Scott Price of the South Pasadena School District in California. That analysis estimated four categories of technology costs that totaled $250 a pupil. The amounts by category should be considered flexible as districts and schools will need to allocate dollars to their highest priority technology needs outlined in state and district technology plans. The per pupil costs for each of the four subcategories are:

- Computer hardware: $71
- Operating systems, productivity and non-instructional software: $72
- Network equipment, printers and copiers: $55
- Instructional software and additional classroom hardware: $52

This per pupil figure would be sufficient to purchase, upgrade and maintain computers, servers, operating systems and productivity software, network equipment, and student administrative system and financial systems software, as well as other equipment such as copiers. Since the systems software packages vary dramatically in price, the figure would cover medium priced student administrative and financial systems software packages.

The $250 per pupil would allow a school to have one computer for every two to three students. This ratio would be sufficient to provide every teacher, the principal, and other key school-level staff with a computer, and to have an actual ratio of about one computer for every three-to-four students in each classroom. This level of funding would also allow for the technology needed for schools to access distance learning programs, and for students to access the new and evolving local online testing programs. Fortunately, most states have developed a substantial technology infrastructure over the years, so nearly all schools in America are linked to the Internet and to district offices and/or a state network. This allocation would be sufficient for small schools as well, particularly today when schools begin with some technology.

Further as noted, we recommend districts either incorporate maintenance costs in lease agreements or, if purchasing the equipment, buy 24-hour maintenance plans, to eliminate the need for school or district staff to fix computers. For example, for a very modest amount, one can purchase a maintenance agreement from a number of computer manufacturers that guarantees computer repair on a next business day basis. In terms of educator concerns that it would be difficult for a manufacturer's contractors to serve remote communities, the maintenance agreement makes meeting the service requirements the manufacturer's or contractor's problem and not the district's problem. Many of the private sector companies that offer such service often take a new computer with them, leave it, and take the broken computer to fix, which often turns out to be more cost effective than to send technicians all around to fix broken computers.

21. Instructional Materials and Formative Assessments

<table>
<tr><th>Current North Dakota Policy</th><th>Evidence-Based Model</th></tr>
<tr><td>There is no specific provision for such resources in North Dakota education or school finance policy. It is a resource that districts and schools can buy with local and state equalization dollars in the general fund.

However, the state requires that districts administer an interim assessment for all students in grades 2-12, and allows for assessing kindergarten students for school readiness. The state included the amount for such interim assessments in the Per Pupil rate.</td><td>Table 2: Instructional Materials in EB Model
<table>
<tr><th></th><th>Elementary School</th><th>Middle School</th><th>High School</th></tr>
<tr><td>Library Texts and Electronic Services</td><td>$20</td><td>$20</td><td>$25</td></tr>
<tr><td>Textbooks and Consumables</td><td>$120</td><td>$120</td><td>$150</td></tr>
<tr><td>Formative, short cycle assessments</td><td>$30</td><td>$30</td><td>$30</td></tr>
<tr><td>Total Instructional Materials</td><td>$170</td><td>$170</td><td>$205</td></tr>
</table>
The EB model also includes $10 per pupil for supplemental instructional and other materials for each of the above tutoring, extended day, summer school, and ELL programs (Elements 6, 7, 8 and 9).

The $7,293 figure included this element.</td></tr>
</table>

<u>Analysis and evidence</u>. The need for up-to-date instructional materials is paramount. Newer materials contain more accurate information and incorporate the most contemporary pedagogical approaches. To ensure that materials are current, twenty states have instituted adoption cycles in which they specify or recommend texts that are aligned to state learning standards (Ratvitch, 2004). Up-to-date instructional materials are expensive, but vital to the learning process. Researchers estimate that up to 90 percent of classroom activities are driven by textbooks and textbook content (Ravitch, 2004). Adoption cycles with state funding attached allow districts to upgrade their texts on an ongoing basis instead of allowing these expenditures to be postponed indefinitely.

The type and cost of textbooks and other instructional materials differ across elementary, middle school, and high school levels. Textbooks are more complex and thus more expensive at the upper grades and less expensive at the elementary level. Elementary grades, on the other hand, use more workbooks, worksheets and other consumables than the upper grades. Both elementary and upper grades require extensive pedagogical aides such as math manipulatives and science supplies that help teachers to demonstrate or present concepts using different pedagogical approaches. As school budgets for instructional supplies have tightened in the past, consumables and pedagogical aides have typically been the first items to be cut as teachers have been forced to make due or to purchase materials out of their own pockets.

The price of textbooks ranges widely. In reviewing the price of adopted materials from a variety of sources, the top end of the high school price ban is notable at $120 per book (see Table 3). Ten to fifteen years ago such prices for textbooks at the high school level were uncommon, but as more students move to take advanced placement courses, districts have been forced to purchase more college-level texts at college-level prices.

Table 3: Costs of Textbooks and Instructional Supplies by School Level (in annual dollars per pupil)

	Elementary School	Middle School	High School
Textbooks	$45 - $70 ($60)	$50 - $80 ($70)	$75 - $120 ($100)
Consumables and Pedagogical Aides	$60	$50	$50
Total	**$120**	**$120**	**$150**

The total figure provides sufficient funds for adequate instructional materials and texts for most non-severe special education students. Modifications for severe special education cases would need to be funded from Special Education funds.

Adoption Cycle. Assuming a purchase of one textbook per student annually allows for a six-year adoption cycle. The six-year adoption cycle fits nicely with the typical secondary schedule of six courses in a six period day (see Table 4). It also comes close to matching the content areas covered at the elementary level.

Table 4: Potential Secondary Six Year Adoption Cycle

Year	2012	2013	2014	2015	2016	2017
Content Area	Science Health P.E.	Social Studies	Foreign Language	Fine Arts	English Language Arts	Mathematics

At the elementary level, there are fewer subject areas to be covered leaving the opportunity for a sixth year in the cycle to be used for purchasing not only additional supplementary texts but also consumables/pedagogical aides (see Table 5).

Table 5: Potential Elementary Six Year Adoption Cycle

Year	2012	2013	2014	2015	2016	2017
Content Area	Language Arts	Mathematics	Social Studies	Science/ Health	P.E., Visual and Performing Arts	Supplements, Consumables, Manipulatives

Short cycle, formative assessments. Data-based decision making has become an important element in school reform over the past decade. It began with the seminal work of Black and Wiliam (1998) on how ongoing data on student performance could be used by teachers to frame and reform instructional practice, and continued with current best practice on how professional learning communities use student data to improve teaching and learning (DuFour, et al., 2010; Steiny, 2009). The goal is to have teachers use data to inform their instructional practice, identify students who need interventions and improve student performance (Boudett, City & Murnane, 2007). As a result, data based decision making has become a central element of schools that are moving the student achievement needle (Odden, 2009, 2012).

Recent research on data-based decision making has documented significant, positive impacts on student learning. For example, Marsh, McCombs and Martorell (2010) showed how data-driven decision making in combination with instructional coaches produced improvements in teaching practice as well as student achievement. Further, a recent study of such efforts using the gold standard of research -- *randomized controlled trial* – showed that engaging in data-based decision making using interim assessment data improved student achievement in both mathematics and reading (Carlson, Borman & Robinson, 2011).

There is some confusion in terminology when referring to these new assessment data. Generally, these data are student performance data different from those provided by state accountability or summative testing, such as North Dakota's end of year tests. The most generic term is "interim data," meaning assessment data collected in the interim between the annual administrations of state tests, though some practitioners and writers refer to such data as "formative assessments." There are at least two kind of such "interim" assessment data. Benchmark assessments, such as those provided by the Northwest Evaluation System called MAP (www.nwea.org), which are given 2-3 times a year, often at the beginning, middle and end of the year. They are meant to provide "benchmark" information so teachers can see during the year how students are progressing in their learning. Sometimes these benchmark assessments are given just twice, once in the fall and again in late spring, and function just as a pre- and post-test for the school year, even though some practitioners erroneously refer to tests used this way as "formative assessments." They cannot be used for progress monitoring in a Response to Intervention program of extra help for struggling students.

A second type of assessment data is collected at shorter time cycles within every quarter, such as monthly, and often referred to as "short cycle" or "formative" assessments. These more "micro" student outcome data are meant to be used by teachers both to plan instructional strategies before a curriculum unit is taught and to track student performance for the two-to-three curriculum concepts that would normally be taught during a nine week or so instructional period.

Examples of "short cycle" assessments include STAR Enterprise from Renaissance Learning, which in an online, adaptive system that provides data in reading and mathematics for grades Prek-12. The basic package costs less than $10 a student per subject, takes students just about 10-15 minutes to take the test, are now aligned to the Common Core, and can be augmented with professional development activities and programs. Many Reading First schools as well as many schools we have studied (Odden & Archibald, 2009; Odden, 2009) use the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) formative assessments (http://dibels.uoregon.edu).

The Wireless Generation (www.wirelessgeneration.com) has created a formative assessment, quite similar to DIBELS, that can be used with a handheld, mobile, electronic device. The company also offers a web service that provides professional development for teachers on how to turn the results into specific instructional strategies, including video clips of how to teach certain reading skills. The cost is approximately $15 per student per year, plus approximately $200 per teacher for the device, and somewhat more for training, though the company usually uses a trainer-of-trainers approach.

Sometimes "interim" assessment data are teacher created but it often is more efficient to start with commercially available packages, most of which are administered online and provide immediate results. Short cycle assessments provide the information a teacher needs to create a micro-map for how to teach specific curriculum units. Though analyses of the state tests provide a good beginning for schools to redesign their overall educational program, and benchmark assessments give feedback on each quarter of instruction and are often used to determine which students need interventions or extra help. Teachers also need the additional short cycle assessment and other screening data to design the details of, and daily lesson plans for, each specific curriculum unit in order to become more effective in getting all students to learn the main objectives in each curriculum unit to the level of proficiency.

When teachers have the detailed data from these interim assessments, they are able to design instructional activities that are more precisely matched to the exact learning status of the students in their own classrooms and school. In this way, their instruction can be much more efficient because they know the goals and objectives they want students to learn, and they know exactly what their students do and do not know with respect to those goals and objectives. With these data they can design instructional activities specifically to help the students in their classrooms learn the goals and objectives for the particular curriculum unit.

The costs of these powerful assessments are modest; the EB model provides $30 per pupil, which is more than sufficient for a school to purchase access to the system, as well as some specific technological equipment and related professional development. The Renaissance Learning STAR assessments can function as both interim and benchmark assessments, include both math and reading Prek-12, and cost less than this figure.

Library Funds. The average national per pupil expenditure for library materials in the 1999-2000 school year was $15 (excluding library salaries). This average varied by region with the West spending $14 per pupil annually and the Eastern states spending $19, and the North Central Region spending $16, with about 40 percent of the total used to purchase books and the remainder was spent on other instructional materials and/or services such as subscriptions to electronic databases (Michie & Holton, 2005).

As the world shifts to more digital resources, libraries are purchasing or using electronic databases such as online catalogs, the Internet, reference and bibliography databases, general article and news databasees, college and career databases, academic subject databases, and electronic full-text books. In 2002, 25 percent of school libraries across the nation had no subscriptions, 44 percent had 1-3 subscriptions to electronic databases, 14 percent had 4-7 subscriptions, and 17 percent had subscriptions to 7 or more. Usually larger high schools subscribed to the most services (Scott, 2004).

Electronic database services vary in price and scope and are usually charged to school districts on an annual per pupil basis. Depending on content of these databases, costs can range from $1-5 per database per year per pupil.

Inflating these numbers to adequately meet the needs of the school libraries, the EB model includes funding of $20 per pupil for elementary and middle schools and $25 per pupil for high

schools to pay for library text and electronic services. These figures modestly exceed the national average, allowing librarians to strengthen print collections. At the same time, it allows schools to provide, and experiment with, the electronic database resources on which more and more students rely (Tenopir, 2003).

22. Student Activities

Current North Dakota Policy	Evidence-Based Model
There is no specific provision for such staff in North Dakota education or school finance policy. It is a set of services that districts and schools can buy with local and state equalization dollars in the general fund. And it is an item that the legislature may not want to include in the base education cost Per Pupil figure	The EB provides: • $200 per pupil for each elementary and middle school student and $250 per pupil for student activities for each high school student. The $7,293 figure included this element.

Analysis and evidence. Elementary, middle and high schools typically provide an array of after-school programs, from clubs, bands, and other activities to sports. Teachers supervising or coaching in these activities usually receive small stipends for these extra duties. Further, research shows, particularly at the secondary level, that students engaged in these activities tend to perform better academically than students not so engaged (Feldman & Matjasko, 2005), though too much extra-curricular activity can be a detriment to academic learning (Committee on Increasing High School Students' Engagement and Motivation to Learn, 2004; Steinberg, 1997).

In earlier adequacy work in a variety of states, the EB model included amounts in the range of $60/pupil for middle school students and $120/pupil for high school students. But subsequent research in additional states has found that these figures are far below what districts and schools actually spend. An amount for student activities equal to $200 per pupil for the prototypical elementary and middle school and $250 per pupil for the prototypical high school is adequate. These figures were included in the $7,293 base cost figure in our 2008 report.

CENTRAL OFFICE RESOURCES

In addition to school-based resources, education systems also need resources for district level expenditures including the district office and operations and maintenance. These are outlined below. The recalibration does not include transportation, food services, or debt service.

23. Central Office Administration

Current North Dakota Policy	Evidence-Based Model
North Dakota does not have a specific policy on central office staffing or structure. All central office staff and services are to be funded under the foundation program and any additional local funds.	The EB Model computes a dollar per pupil figure for the Central office based on the number of FTE positions generated and the salary and benefit levels for those positions. For SY 2013-14, the estimate for the Central Office is $625 per pupil. The $7,293 figure included this cost element. **Table 7: Central Office Staffing**

Central Office Staffing	
Prototypical District of 3,900 students	
Office and Position	**FTE**
Superintendent's Office	
Superintendent	1
Secretary	1
Business Office	
Business Manager	1
Director of Human Resources	1
Accounting Clerk	1
Accounts Payable	1
Secretary	1
Curriculum and Support	
Assistant Superintendent for Instruction	1
Director of Pupil Services	1
Director of Special Education	1
Director, Assessment and Evaluation	1
Secretary	3
Technology	
Director of Technology	1
Computer Technician	1
Secretary	1
Operations and Maintenance	
Director of M & O	1
Secretary	1
Other Expenses	
Miscellaneous (purchased services, supplies, legal, audit, association fees, elections, technology, etc.)	
Communication	

Analysis and evidence: We have identified resources for these positions in other reports and the most recent version of our text (see for example, Odden & Picus, 2014; Picus & Odden, 2010)

drawing on a variety of research studies and professional standards for best practices. Over the past several years, we have developed central office staffing recommendations in five states, Washington, Wisconsin, North Dakota, New Jersey and Texas. In all states, we began our analysis with the research of Elizabeth Swift (2007), who used professional judgment panels to determine staffing for a prototypical district. That research addressed the issue of the appropriate staffing for a district of 3,500 students. Swift's work formed the basis of each states' analysis, where in three states (Washington, Wisconsin and North Dakota) we also conducted professional judgment panels to review the basic recommendations that emerged from Swift's research to estimate central office staffing requirements.

Through that work we were able to estimate the central office resources required for a district of 3,500 students. The initial studies provided for about 8 professional staff (superintendent, assistant superintendent for curriculum, business manager, and directors of human resources, pupil services, special education, technology and special education) and nine clerical positions. Although the research basis for staffing school district central offices is relatively limited, analysis of the Educational Research Service (2009) Staffing Ratio report shows that nationally school districts with between 2,500 and 9,999 students employ an average of one central office professional/administrative staff member for every 440 students (Educational Research Services, 2009). This equates to about eight central office professionals (7.95) in a district of 3,500 students. Our research based staffing formula of 8 FTE professional staff matches the ERS estimate of 8 FTE central office staff for a school district of 3,500 students nationally.

Because the 3,500 student district size did not readily incorporate our prototypical schools, parameters for which are needed to estimate maintenance and operations costs, over the past two years we increased our prototypical district size to 3,900 students so it would include, as noted above, four 450 student elementary schools, two 450 student middle schools, and two 600 student high schools. This larger size also helps us add the testing and evaluation, and computer technician staff, which districts have been arguing are needed today, while staying generally within the ERS parameters. The EB model includes ten professional staff positions and nine clerical staff for the central office of a prototypical school district with 3,900 students.

In addition to staffing, central offices need a dollar per pupil figure for such costs as insurance, purchased services, materials and supplies, equipment, association fees, elections, district wide technology, communications, and other costs.

Table 6 summarizes these staffing proposals organized into departments into which a central office could be organized. Larger districts would be provided the resources for a larger central office by prorating up the per pupil cost of this 3,900 pupil central office, and also could have more differentiated staff with coordinators as well as a full-fledged legal counsel for large districts.

Appropriate central office staffing levels could be further adjusted for smaller as well as perhaps for larger districts. From our work in other states, the per pupil figure works until districts have about 390 students, ten percent of the size of the 3,900 student prototypical district. We show how the central office staffing has been adjusted for smaller districts in the section below on small district adjustments (see Table 13 on page 71).

24. Operation and Maintenance

Current North Dakota Policy	Evidence-Based Model
Like Central Office, North Dakota expects its districts to fund operation and maintenance costs from general state and local revenues.	Using the formulas described below, EB computes a dollar per pupil figure for the Central Office based on the number of FTE positions generated and the salary and benefit levels for those positions. For SY 2013-14, the estimate for Operations and Maintenance is $757 per pupil. Because this differs so substantially from the actual M & O figure of $1,167 for 1012-13, we use the actual figure. The $7,293 figure included an M & O figure, derived from actual expenditures in 06-07, but not calculated from the following model.

Analysis and evidence: Drawing on professional standards in the field as well as research, we have recently conducted analyses of the cost basis for maintenance and operations (e.g., Picus & Odden, 2010; Picus & Seder, 2010). The discussion below summarizes our research on operations and maintenance, identifying the costs for custodians (school level), maintenance staff (district level) and groundskeepers (school and district level), as well as the costs of materials and supplies to support these activities.

Custodians*:* Custodians are responsible for the daily cleaning of classrooms and hallways as well as for routine furniture set ups and takedowns. In addition, custodians often manage routine and simple repairs like minor faucet leaks, and are expected to clean cafeterias/multipurpose rooms, lockers and showers. Custodial workers' duties are time-sensitive, are structured and varied. Zureich (1998) estimates the time devoted to various custodial duties:

- Daily duties (sweep or vacuum classroom floors; empty trash cans and pencil sharpeners in each classroom; clean one sink with faucet; and, security of room), which take approximately 12 minutes per classroom.
- Weekly duties (dust reachable surfaces; dust chalk trays and clean doors; clean student desk tops; clean sink counters and spots on floors; and, dust chalk/white boards and trays), each of which adds 5 minutes a day per classroom.
- In addition to these services, non-cleaning services (approximately 145 minutes per day) provided by custodians include: opening school (checking for vandalism, safety and maintenance concerns), playground and field inspection, miscellaneous duties (teacher/site-manager requests, activity set-ups, repairing furniture and equipment, ordering and delivering supplies), and putting up the Flag and PE equipment.

A formula that takes into consideration these cleaning and non-cleaning duties has been developed and updated by Nelli (2006). The formula takes into account teachers, students, classrooms and Gross Square Feet (GSF) in the school. The formula is:

- 1 Custodian for every 13 teachers, plus

- 1 Custodian for every 325 students, plus
- 1 Custodian for every 13 classrooms, plus
- 1 Custodian for every 18,000 Gross Square Feet (GSF), and
- The total divided by 4.

The formula calculates the number of custodians needed at prototypical schools. The advantage of using all four factors is that it accommodates growth or decline in enrollment and continue to provide the school with adequate coverage for custodial services over time.

To show how this formula translates into a per pupil cost for custodial services, we have used the 3,900 student prototypical school district. This district includes four 450-student prototypical elementary schools, two 450-student middle schools, and two 600-student high schools. Using the resource allocations identified above in Table1, and assuming that teachers are the core, elective, special education and instructional coaches at each school, each of whom has a classroom,[4] we identify the resources each school would have and use those to estimate the number of custodians needed for each school and the district.

Table 8 summarizes the custodial computations for this prototypical school district. Column 2 displays the enrollment of each school. Column 3 indicates the number of classrooms that enrollment generates at the pupil teacher ratios described above. This figure includes classrooms for special education programs as well as the regular program. Column 4 provides the number of teachers at each school. Colum five uses average state facility standards to estimate the gross square footage of prototypical schools in our prototype district.[5] The number of custodians in each school uses the formulas above and is displayed in Column 6. In addition, we recommend an additional half time custodian for the high school to accommodate the higher number of after school and evening activities that typically occur at high schools. For this prototypical school district, total custodians would amount to 23 including a half time custodian at the district office.

Table 8: Prototypical District Custodial Computations

School Type (1)	Enrollment (2)	Classrooms (3)	Teachers (4)	Gross Square Feet (5)	Custodians (6)
Elementary	450	34	34	62,950	2.53
Elementary	450	34	34	62,950	2.53
Elementary	450	34	34	62,950	2.53
Elementary	450	34	34	62,950	2.53
Middle	450	27	27	62,784	2.26
Middle	450	27	27	62,784	2.26
High School	600	39	38	106,887	3.93
High School	600	39	38	106,887	3.93
District Total *	3,900	268	266	591,142	22.48

*Includes half time custodian at the district office

[4] Though it could be argued that coaches do not need classrooms, this includes potential classroom space for tutors.
[5] In previous work, Arkansas standards were used to approximate the square footage requirements for prototypical schools. The Arkansas standards are in about the middle of state standards that are available (see Seder, 2012). But for the M & O calculations for North Dakota, we used North Dakota gross square footage standards for buildings.

Maintenance Workers: Maintenance workers function at the district level, rather than at individual schools. Core tasks provided by maintenance workers include preventative maintenance, routine maintenance and emergency response activities. Individual maintenance worker accomplishment associated with core tasks are: (a) HVAC systems, HVAC equipment, and kitchen equipment; (b) Electrical systems, electrical equipment; (c) Plumbing systems, plumbing equipment; and, (d) Structural work, carpentry and general maintenance/repairs of buildings and equipment (Zureich, 1998).

Zureich (1998) recommends a formula for maintenance worker FTEs incorporated into the funding model for instructional facilities as follows:

[(# of Buildings in District) x 1.1 + (GSF/60,000 SqFt) x 1.2 + (ADM/1,000) x 1.3 + General Fund Revenue/5,000,000) x 1.2] / 4 = Total number of Maintenance Workers needed.

We use a figure of $10,000 per pupil in revenues to estimate the number of maintenance workers in the prototypical district. Applying this formula to the prototypical district described for custodians results in just over nine maintenance workers for our prototype district. This is shown in the Table 9.

Table 9: Maintenance Workers in Prototypical School District

Category	Number	Factor	Combined
Number of Buildings	9	1.1	9.9
Gross Square Footage	9.68	1.2	11.82
Enrollment /1,000	3.83	1.3	5.07
General Fund Revenue (10,000/student)	7.66	1.2	9.36
Total FTE Maintenance Workers			9.04

Maintenance and Custodial supplies are estimated at $0.70 per gross square foot. The school gross square feet are 591,142 plus an estimated 10 percent more for the central office, bringing total district gross square footage to 650,256 and the cost of materials and supplies to $447,414 or $116.88 per pupil.

Grounds Maintenance: The typical goals of a school grounds maintenance program are generally to provide safe, attractive, and economical grounds maintenance (Mutter & Randolph, 1987). This, too, is a district level function. A theoretical example of a work crew's responsibility at various school levels in acres and days per year is expressed in Table 10, which uses the prototypical school district as an example.

Table 10: Groundskeeper Example

Facility Type	Crew Members	Site Acres	Days	Factor
Elementary School	3 Groundskeepers	14.2	62 days = [31 acre site hours x 16 acres/8 hrs. per day]	1
Middle School	3 Groundskeepers	24.2	93 days = [31 acre site hours x 24 acres/8 hrs. per day]	1.5
High School	3 Groundskeepers	40.6	155 days =[31 acre site hours x 40 acres/8 hrs. per day]	2.5

These factors can be used for the prototypical school district to estimate the total number of Grounds staff needed grounds keeping as follows:

Table 11: Groundskeepers in Prototypical School District

School Type	Acres	Days	Factor	Total Days
Elementary	14.2	62	1	62
Elementary	14.2	62	1	62
Elementary	14.2	62	1	62
Elementary	14.2	62	1	62
Middle	24.2	93	1.5	139.5
Middle	24.2	93	1.5	139.5
High school	40.6	155	2.5	387.5
High school	40.6	155	2.5	387.5
Total Days Required				1,302.00
Number of FTE at 220 days per FTE				5.92
Additional Groundskeeper for Central Office				1

Table12 summarizes the number of custodians, maintenance workers and groundskeepers for this prototypical district.

Table 12: Total Maintenance and Operations FTE in Prototypical School District

Category	FTE
Custodians	22.48
Maintenance	9.04
Groundskeepers	6.92
Total	38.44

To estimate the district's expenditures for maintenance and operations, the number of positions in each category would be multiplied by the average total compensation for each position and added to the $447,415 for materials and supplies. This figure is easily computed on a per-pupil basis by dividing by district enrollment.

It is necessary to add the per pupil costs of utilities and insurance to these totals. It is unlikely that a district has much control over these costs in the short run and thus each district can best estimate future costs using their current expenditures for utilities and insurance as a base.

In the course of our research on maintenance and operations, we identified an alternative approach for estimating the costs of these services. APPA, a professional association dedicated to educational facilities management offers staffing ratios that can be used to estimate resource needs for schools districts. APPA has staffing standards for maintenance workers, custodians, and groundskeepers; the same staff categories for which funding was estimated above. These staff resources are allocated according to different service care and stewardship levels. After careful review of APPA's web site and publications (APPA, 1998, 2001, 2002), which are considered industry standards for educational facilities, we found the APPA staffing ratios offered a strong research basis for establishing an appropriate benchmark for estimating the cost basis for O&M.

APPA standards offer a range of services levels. We estimated the costs associated with the staffing levels generated through APPA and compared them to the resources we identified above, using the Wyoming School Funding Model as the basis of comparison. Our baseline estimates suggest that using the APPA standards would generate resources comparable to those M&O resources currently provided for in the EB Model through a combination of the staffing ratios, funding for supplies and materials, and the resources for purchased services.

As indicated above, the number determined by the above model for Maintenance and Operations, $757, is substantially lower than the actual figure for 2012-13 of $1,167. Thus, until we determine the reason for the difference, we use the actual figure in our calculations of the Per Pupil figure.[6] However, we used our M & O model figure for the small district adjustment.

[6] For example, Maine's actual expenditures for Operations and Maintenance include both minor as well as major facilities repair, and we were not able to tease out the major facilities repair portion. Thus we used that state's actual M & O expenditure per pupil figure in calculating that state's foundation number. Our model is designed to include only minor facilities repairs.

RESOURCES FOR SMALL SCHOOLS AND DISTRICTS

Because many districts in North Dakota have a student population of less than 3,900 students, one question is whether the above formulas and staffing allocations "work" for districts with fewer than 3,900 students. We have analyzed these numbers and find that the answer is yes for a district down to about 975 students, which is one-fourth the size of the 3,900-student prototypical district. A district with 975 students would have 75 students per grade and could have one 450 student elementary school with typical staffing, one 225 student middle school and one 300 student high school, each with typical, but prorated, staffing. Below 975 students we conclude that additional staff support are required for an adequate program.

North Dakota has a small district weight that for high school district ranges from 1.35 for districts with an ADM less than 125 to 1.03 when the district has just under 400 students (the weight is 1.02 for districts with an ADM from 400 to 599, and 1.01 for districts with an ADM from 600 to 899). For elementary districts, the weight is 1.25 for ADM less than 125 students, 1.17 from 125 to 199, and 1.0 above that. The EB small size adjustment break points below are in the same range as those that North Dakota has adopted, but the adjustments are larger.

Table 13 displays the current EB approach for PK-12 school district administrative units with 390 and fewer pupils. The "Element" column shows the various staffing categories. Column 2 shows what the regular formulas above would provide to the school, and columns 3, 4 and 5 show the staffing for school districts of smaller sizes. We have increased core and specialist teachers from the 23.2 positions the regular formula generates to an even 24 for a school district with 390 students, and 13 for a district with 195 students. For a district with 97.5 students or fewer, which is half of 195, we recommend staffing for one administrator position at the rate of an assistant principal and 1 FTE teacher position for every 7 students, exclusive of special education, which provides staffing the very small school can deploy in any way it wishes. We have used this approach in a number of states and it provides very small school districts with adequate staffing levels along with the flexibility to allocate the staff in a way that works best for the individual district. This formula produces the 13.93 positions shown in column 5.

In reviewing the numbers in Table 13 for the 390 student district, we generally have rounded up partial FTEs for the "regular" formula district (column 2) to a whole number for several positions (column 3) including instructional coaches, librarian, guidance counselor/nurse, secretaries and supervisory aides, and then taken half that number for the 195 student district. All small districts receive the same dollar per pupil numbers for professional development trainers, technology/equipment, instructional materials, assessments, student activities and gifted and talented programming.

In the spring when we address the issue of weights, we will compare the state's current small district weights to the EB weights and make a recommendation for the state moving forward.

Table 13: EB Staffing for Schools in SAUs with 390 or Fewer Pupils

Element	Regular Formula 390 Pupils	Small K12 School/ District: 390 Pupils	Small K12 School/ District 195 Pupils	Small K12 School/ District 97.5 Pupils
Core and Elective Teachers	23.2	24	13	13.93
Tutors	0.85	1	0.5	--
Special Ed (Census) Teachers	2.6	3	1.5	1
Special Ed (Census) Aides	2.6	3	1.5	1
Instructional Coaches	1.94	2	1	--
Substitute Teachers	5%	1.61	0.88	--
Counselors/Nurse	~2	2	1.0	--
Supervisory Aides	1.8	2	1	--
Librarians	0.8	1	0.5	--
Principal	0.8	1	1	--
Assistant Principal	0.2	1	0	1
Secretary	1.8	2	1	--
Professional Development	$100/Pupil	$100/Pupil	$100/Pupil	$100/Pupil
Computer Technology	$250/Pupil	$250/Pupil	$250/Pupil	$250/Pupil
Instructional Materials/Assessments	$179/Pupil	$179/Pupil	$179/Pupil	$179/Pupil
Student Activities	$213	$213	$213	$213
Gifted/Talented	$25	$25	$25	$25
Central Office				
Professional Staff		2	1	1
Support Staff		2	1	1
Misc Expenses		$300	$300	$300
M & O				
Custodians		2	1	0.5
Maintenance		1	0.5	0.25
Groundskeepers		1	0.5	0.25

CALCULATING A NEW PER PUPIL NUMBER

Table1 at the beginning of this report summarizes all of the EB staffing ratios and formulas for prototypical elementary, middle and high schools.

We incorporate these prototypical school model figures into a prototypical school district with 3,900 pupils with about 300 students a grade in four 450-student elementary schools, two 450-student middle schools and two 600-student high schools. To create a per pupil figure that could be used in a foundation program, for example, we put prices on all the ingredients in Table1 to compute a per pupil figure, and then add to that total a cost per pupil for the central office and for maintenance and operations (as shown for Elements 23 and 24 above). The combined figure will be our recalibrated per pupil figure that can then be compared to the $8,820 figure currently in the state's formula.

Because North Dakota has many small districts with far fewer than 3900 students, we also computed a per pupil figure for a prototypical district half that size, or 1,950 students (with two 450 student elementary schools, one 450 student middle school, and one 600 student high school). We expected to and actually found a very small difference across the two-prototypical district sizes ($27 dollars per pupil), which has been our experience in other states and which suggests that even though the 3900 student district is larger than most districts, it still provides a good estimate of an adequate foundation per pupil level. Further and as just discussed in the previous section, we also have small district adjustments, specifically for districts with 390 students, 195 students and 97.5 and fewer students.

We also calculate the Per Pupil figures with different salary and benefit levels, which reflect different ways to adjust salary levels from the 2008 base year, as shown in Table 14. We note several characteristics of the numbers in Table 14. First, teacher compensation, which includes the additional 8 days for a total of 10 pupil free days for professional development training, rose by about the actual inflation of an average of 2% over the six years from 2007 to 2013. The 3.2 inflation factor actually used to adjust the original $7,293 figure for the 2013-14 school year would allow districts to raise teacher salaries to even higher levels. Second, administrator salaries appear to have been raised above both the actual CPI over the past six years and the 3.2% used to adjust the formula. Third, unlike the situation in 2006-07, we were able to obtain actual salaries for instructional coaches, librarians and guidance counselors for 2012-13, and have used them in estimating the per pupil figure. We also used a figure of 26% of salary for certified positions and 50% of salary for classified positions because in all other states the benefit rate for lower salaried positions is always much larger than for higher salaried, certified positions.

Table 14[7]
North Dakota Model Compensation Levels (2013-14)

Position	Average Salary and Benefits 2006-07	Actual Average Salary and Benefits 2012-13	Actual Average Salary and Benefits 2012-13 Inflated by 3.2% annually	Actual Average Salary and Benefits 2012-13 Inflated by annual CPI
School Building				
Principal	$79,527	$97,702	$96,071	$89,559
Asst. Principal	$66,664	$83,046	$80,532	$75,073
Teacher	$52,784	$60,842	$63,765	$59,443
Instructional Coach	$52,784	$69,146	$63,765	$59,443
Librarian	$52,784	$62.330	$63,765	$59,443
Counselors	$52,784	$66,929	$63,765	$59,443
Secretary	$29,391	$38,339	$35,505	$33,099
Supervisory Aide	$23,509	$28,143	$28,399	$26,474
Substitutes	$135 per day	$58,307	$63,765	$59,443
Central Office				
Superintendent	$94,956	$117,309	$114,710	$106,935
Asst. Superintendent	$79,190	$99,712	$95,663	$89,179
Director	$84,410	$95,058	$101,970	$95,058
Secretary	$29,391	$38,339	$35,505	$33,099

[7] Principal base salaries and benefits are based on the average actual base salaries and 26 percent benefits.
Assistant Principal base salary and benefits are 85 percent of principal average salary and benefits. This percentage is based on the ratio of assistant principal average base salary to principal base salaries in schools with assistant principals.
Teacher base salaries and benefits are based on the average actual base salaries and 26 percent benefits.
2012-13Secretary /Clerical position salaries are based on actual average secretary hourly rate of $16.64 * 192 days * 8.0 hours per day. Benefits are set at 50 percent of salary (This methodology applies to secretary/clerical positions in both schools and the central office.)
2012-13 Supervisory aide salaries are based on actual average aide hourly rate of $13.96 * 192 days * 7.0 hours per day. Benefits are set at 50 percent of salary
Superintendent base salaries and benefits are based on the average actual base salaries and 26 percent benefits.
Assistant Superintendent base salary and benefits are 85% of superintendent average actual base salary and benefits. This percentage is based on the ratio of assistant superintendent average salary to superintendent salaries in districts with assistant superintendents.
Director base salaries and benefits are based on the average actual salaries and 26 percent benefits.

Table 15 shows estimates of the recalibrated Per pupil figure. Using the actual average salaries and benefits for 2012-13, the recalibrated Per Pupil figure would be $8,529 as compared to the $8,810 figure used in the foundation formula. Using salaries inflated just by an average CPI inflation figure of 2% over the six years from 2007 to 2013, the recalibrated Per pupil figure would be $8,191. And using the 3.2% figure actually used to inflate the $7,293 figure from the 2008 adequacy study, the recalibrated Per Pupil figure would be $8,624. All of these estimates are lower than the actual $8,810 enacted by the 2013 Legislature, which suggests that the North Dakota school funding formula provides adequate funding for the base program.

Table 15
Recalibrated Per Pupil Figures Compared to $8,810 Used in 2014 Funding Formula

Per Pupil Figure	Using Actual Average Salaries for 2012-13*	Inflating Salaries by 2% CPI from 2008*	Inflating Salaries by 3.2 % from 2008*
Prototypical District of 3900 Students	$8,529	$8,191	$8,624
Small District at 390 Students	$9,017	$8,626	$9,152
Small District at 195 Students	$9,483	$9,082	$9,636
Small District at 97.5 Students	$13,980	$13,484	$14,344

*Includes eight extra days for professional development.

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