DESK AUDIT OF
THE ARKANSAS SCHOOL FUNDING MATRIX
AND
DEVELOPING AN UNDERSTANDING OF THE POTENTIAL COSTS OF BROADBAND ACCESS FOR ALL SCHOOLS

Prepared for the

Arkansas House & Senate Committees on Education

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EXECUTIVE SUMMARY

This Desk Audit was prepared for the Arkansas Legislature's House and Senate Committees on Education to provide information on two critical topics – school funding levels through the state's funding matrix, and an overview on how to understand the costs of providing broadband data services to all of the schools in the state.

Today, under Arkansas Code §10-3-2102, the Legislature's Education committees are required to "review and continue to evaluate the amount of per-student expenditure necessary to provide an equal educational opportunity and the amount of state funds to be provided to school districts, based upon the cost of an adequate education, and monitor the expenditures and distribution of state funds and recommend any necessary changes." In response to that requirement, the matrix has been updated on a regular basis, adjusting the cost factors for each resource element by a rate of inflation or other reasonable measure of cost changes. Further, every two years an analysis of expenditures from foundation and other funding sources has been conducted.

In the eight years since Picus Odden & Associates (formerly Lawrence O. Picus and Associates) last reviewed the matrix, there have been a number of advances in education research and the evidence on which Picus Odden & Associates develop their EB model. The purpose of this study is to provide the Legislature with a desk audit focused on how the Picus Odden and Associates' Evidence-Based model has changed over the years and how the current EB model's formulas, ratios and per pupil figures compare to the elements of Arkansas' current funding matrix. The study does not attempt to estimate the cost differential between the current matrix and a matrix based on the EB model as it has been modified since 2006, but rather shows the degree to which, based on new evidence, our experience in other states, and the changing needs of Arkansas school children, the EB model's resource allocation are similar to, the same as, or different from Arkansas' current funding matrix. Table 2.1 provides a summary of all these comparisons.

The final chapter of this report provides information on how the Legislature and other state officials can evaluate and plan for the costs of providing broadband services to all schools in Arkansas. That chapter outlines the many issues the Education committees need to understand in order to ascertain the most cost effective way to provide broadband services to all schools in Arkansas. Estimates of the costs of those services are not provided because more information on individual school and district needs and contexts are required. The chapter does discuss the distinction between one time capital costs and the ongoing costs of providing broadband services to schools.

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INTRODUCTION AND OVERVIEW

In 2004, the Arkansas Legislature adopted a new school funding formula in response to the Arkansas Supreme Court's ruling in the *Lakeview v. Huckabee* case. The ruling held that funding for K-12 education was inadequate and thus violated the education clause of the Arkansas Constitution that requires the state "…maintain a general, suitable and efficient system of free schools…" To develop that new funding system, the Legislature employed Lawrence O. Picus and Associates, now operating as Picus Odden & Associates, to estimate an adequate level of funding.

Working closely with the Legislature's Joint Committee on Educational Adequacy, Picus Odden & Associates developed an Evidence-Based (EB) approach for estimating the level of funding for Arkansas schools (Odden, Picus & Fermanich, 2003). The model was developed using a research-based model of school improvement and estimated school level resources and their associated costs for a set of prototypical schools – an elementary, middle and high school. The elements of the school improvement model were identified by rows in a table, with the columns indicating the resources needed to meet each element of the model for each prototypical school. The cost of each of these elements was then estimated, combined with estimated district and state level costs, to provide a new overall funding level for Arkansas schools.

Actual implementation of the EB model was slightly different. Rather then three types of prototypical schools, the 2004 session of the Legislature elected to determine resource needs – and their respective costs – for a 500-student K-12 school. The resulting table had two columns, the first listing individual resources (e.g., teachers, instructional materials, administrative staff) needed to operate schools and school districts, and the second indicating the level of dollars necessary for each element for that 500-student prototypical school. That two column, multi-row table became known as the "matrix" and the term matrix is used today to describe the table that estimates the cost of the resources needed to provide an adequate education for all of Arkansas' public school children.

In 2006, Picus Odden & Associates recalibrated the Arkansas matrix adding some new elements based on new research and their policy work in other states (Odden, Picus & Goetz, 2006). That report also included a study of use of resources in schools and found that while funding appeared to be adequate, many schools were not using the funds in the most effective way, and identified a number of schools that had been successful in using the EB based model to improve student performance. In 2007, the Arkansas Supreme Court held the system to be constitutional, and it remains in place today with some modifications.

Today, under Arkansas Code §10-3-2102 the Legislature's Education committees are required to "review and continue to evaluate the amount of per-student expenditure necessary to provide an equal educational opportunity and the amount of state funds to be provided to school districts, based upon the cost of an adequate education, and monitor the expenditures and distribution of state funds and recommend any necessary changes." In response to that requirement, the matrix has been updated on a regular basis, adjusting the cost factors for each resource element by a rate of inflation or other reasonable measure of cost changes.

The Bureau of Legislative Research also provides a biennial review of how the funding in the matrix is computed and then distributed across school and district resources. The report also compares how the funds are generated for school districts to how those funds are actually expended by the districts to purchase educational resources. The Bureau's most recent report was presented to the Interim Education Committees on July 15, 2014.

In the eight years since Picus Odden and Associates last reviewed the matrix, there have been a number of advances in education research and the evidence on which Picus Odden & Associates develop their EB model. The purpose of this report is to provide the Legislature with information on how the Picus Odden and Associates' EB model has changed over the years and how, if implemented those changes would impact the elements of the current funding matrix. The study does not attempt to estimate the cost differential between the current matrix and a matrix based on the EB model as it has been modified since 2006, but rather shows those places where, based on new evidence, our experience in other states, and the changing needs of Arkansas school children, the EB model's resource allocation has changed. In addition, the final chapter of this report provides information on how the Legislature and other state officials can evaluate and plan for the costs of providing Broadband services to all schools in Arkansas.

The report begins with a brief description of the school improvement model that undergirds the EB model. This discussion is found in Chapter 1. Additional details on the school improvement model and how it has changed over time are provided in Appendix A of this report. Because the EB model is based on research about school improvement, Chapter 2 provides detailed research findings for each resource element in the EB model. Table 2.1 compares our original EB recommendations with the matrix currently used in Arkansas and with our current EB recommendations for Arkansas. The table outlines the resources generated in a 500-student K-12 school under the current matrix and under today's EB model. Following that summary table, we describe the research that led to our original recommendations and the research that has led to any changes we now recommend in the EB model. Each line of Table 2.1 represents a separate section of the balance of that chapter where we offer descriptions of the evidence base for that resource and how our model has changed since 2006, if such changes have been made.

Chapter 3 presents our findings from our analysis of Broadband service and possible costs. The analysis describes the many factors necessary to estimate the costs of providing broadband services to schools including the one-time capital costs and the ongoing operational costs of broadband service. Unfortunately, the chapter does not provide an estimate of the actual costs likely to be incurred as that would require a much more extensive study (such as the one envisioned by the BLR's recent Request for Proposals) to assess the broadband needs and costs

of service provision in all Arkansas schools and districts. The chapter instead offers information on what factors need to be considered, and provides some broad range estimates of costs across Arkansas today and in other states.

CHAPTER 1: THE SCHOOL IMPROVEMENT MODEL

The Evidence-Based model that we use to estimate an adequate spending level for schools is based on a school improvement model developed through continued review of research on how schools improve student performance. We focus on two major types of research:

1. Reviews of research on the student achievement effects of each of the model's major elements, with a focus more recently on randomized controlled trials, the "gold standard" of evidence on "what works"
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.

Our 2006 recalibration of the Arkansas school funding system argued that schools could produce notable improvements in student performance if they strategically used the resources included in the state's new funding formula. Since completing that work, we have continued to enhance the details of the strategy of school improvement embedded in the Evidence-Based funding model. We most recently summarized our findings in the fifth edition of our textbook (Odden & Picus, 2014) and in several books that profile schools and districts that have moved the student achievement needle (Odden & Archibald, 2009; Odden, 2009; Odden, 2012).

Today, we organize the elements of our school improvement model into ten areas. In general, we find that schools and districts that produce large gains in student performance follow ten similar strategies, resources for each of 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 usually first includes review of state test results and then, over time, analysis of formative/short cycle as well as benchmark assessments to help tailor instruction to precise student needs, to progress monitor students with an Individual Education Plan to determine whether interventions are working, and to follow the progress of students, classroom and the school over the course of the academic year. Improving schools are "performance data hungry."

2. Set higher goals such as aiming to educate at least 95 percent of the students in the school to proficiency or higher on state reading and math tests; seeing that a significant portion of the school's students reach advanced achievement levels; having more high school students take and pass AP classes; and making significant progress in closing the achievement gap. The goals tend to be explicit as just noted, and far beyond just producing "improvement" or "making AYP." Further, the goals are ambitious and, even when not fully attained, help propel the school toward producing large gains in student performance.

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 is to deliver that

curriculum. Changing curriculum is a must for schools implementing more rigorous college and career ready standards. And such new curriculum requires changes in instructional practice. Successful schools also want *all* teachers to learn and deploy new instructional strategies in their classrooms so also seek to make good instructional practice systemic to the school and not idiosyncratic to each teacher's individual classroom.

4. Invest heavily in teacher training that includes intensive summer institutes and longer teacher work years, provides resources for trainers, and, most importantly, funds instructional coaches in all schools. Time is provided for teacher collaboration focused on improving instruction. Nearly all improving schools have found resources to fund instructional coaches to work with school-based teacher data teams, to model effective instructional practices and to observe teachers and give helpful but direct feedback. This focus has intensified now that schools are delivering a more rigorous curriculum focused on educating all students to college and career proficiency levels. And professional development is viewed as an ongoing and not a "once and done" activity.

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 many cases this also includes extended days, summer school, and English language development for all ELL students. These Tier 2 interventions in the Response to Intervention (RTI) approach to helping struggling students achieve to standards are absolutely critical. For many students, one dose of even high quality instruction is not enough; many students need a combination of extra help services in order to achieve to their potential. No school producing large gains in student learning ignored these extra help strategies altogether or argued that small classes or preschool were substitutes.

6. 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. Further, most improving schools today organize teachers into collaborative teams – grade level teams in elementary schools and subject/course teams in secondary schools. These teams collaboratively develop curriculum units, lesson plans to teach them, and common assessments to measure student learning. Further, teams debrief on the impact of each collaboratively developed unit, reviewing student learning across classrooms.

7. Provide strong leadership and support of data-based decision making and improving the instructional program, usually through the superintendent, the principal and teacher leaders. Instructional leadership is "dense" and "distributed" in successful schools; leadership derives from the teachers coordinating collaborative teacher teams, from instructional coaches, the principal and even district leaders. Both teachers and administrators provided an array of complementary instructional leadership.

8. Create professional school cultures characterized by ongoing discussion of good instruction and teachers taking responsibility for the student performance results of their

actions. The collaborative teams that deliver instruction produce over time a school culture characterized by: 1) high expectations of performance on the part of both students and teachers, 2) a systemic and school-wide approach to effective instruction, 3) a belief that instruction is public and that good instructional practices are expected to be deployed by every individual teacher, and 3) an expectation that the adults in the school are responsible for the achievement gains (or not made) by students. Professionals in these schools accept responsibility for student achievement results.

9. Bring external professional knowledge into the school, e.g., hiring experts to provide training, adopting new research-based new curricula, discussing research on good instruction, and working with regional education service agencies as well as the state department of education. Successful schools do not attain their goals by "pulling themselves up by their own boot straps." They aggressively seek outside knowledge, find similar schools that produce results and benchmark their practices, and operate in ways that typify professions.

10. Finally, talent matters. Many improving schools today consciously seek to recruit and retain the best talent, from effective principal leaders to knowledgeable, committed and effective teachers. They seek individuals who are mission-driven to boost student learning, willing to work in a collaborative environment where all teachers are expected to acquire and deliver the school's view of effective instructional practice, and who are accountability focused.

These ten steps are different from the six steps we used in our initial adequacy study and recalibration in Arkansas in 2003 and 2006. The ten are more comprehensive than the original six categories and more closely reflect the theory of action embedded in the EB model. We have included the six steps used in previous Arkansas studies in the Appendix for interested readers.

We have also studied improving schools in Vermont and Maine as part of school finance studies we recently completed in both states (see http://picusodden.com/cases-of-improving-schools/). We found the theory of improvement embodied in the Evidence-Based model is reflected in nearly all these successful schools (Picus, Odden, et al., 2011; Picus, Odden, et al., 2013). In other words, the schools we have studied that successfully boosted student performance have deployed a set of strategies that are strongly aligned with those embedded in the EB model. 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 substantial gains in student academic performance.

Successful schools in Arkansas (Chenoweth, 2007, 2009) and other studies (e.g., Blankstein, 2010, 2011) also use these same practices. These practices bolster our claim that if funds are provided and used to implement these effective strategies, significant student performance gains should follow. In the sections of this report that follow, we describe an evidence-based approach to conducting a desk audit of the resources needed by *all* Arkansas schools to dramatically improve student performance in all core subjects and at all grade levels.

CHAPTER 2: USING THE EVIDENCE-BASED APPROACH TO CONDUCT A DESK AUDIT OF THE ARKANSAS FUNDING MATRIX

This chapter uses the Evidence-Based (EB) model to conduct a desk audit of the matrix that is the foundation for the state's school funding system. The four parts of this chapter include the following:

- Staffing for core programs
- Dollar per student resources
- Carry forward: maintenance and operations, central office, and transportation
- Categorical programs: extra help strategies for struggling students.

Table 2.1 below provides a summary of all the desk audit recommendations suggested by the EB model. The text that follows provides a comparison of the 2003 EB recommendations, current Arkansas policy, and current EB model recommendation, followed by analysis and evidence supporting the EB model's ratios and formulas. The evidence section for each element of the matrix is then followed by an analysis of how districts in Arkansas have the used the resources provided by the Arkansas funding formula for that particular element.

Before proceeding, we note that the design of the EB model, which includes core and elective teachers for all children and provides additional resources for struggling students, reflects the Response to Intervention (RTI) model. RTI is a three-tier approach to meeting student needs. Tier 1 refers to core instruction for all students. The EB model seeks to make core instruction as effective as possible both with its modest class sizes, provisions for collaborative time, and robust professional development resources. Effective core instruction is the foundation on which all other educational strategies depend. Tier 2 services are provided to students struggling to achieve to standards before being given an IEP and labeled as a student with a disability. The EB model's Tier 2 resources include one core tutor for every 500 students and additional dollars triggered by NSL and ELL student counts that provide resources for tutoring, extended day, summer school and additional pupil support. Tier 3 includes all special education services.

Table 2.1
Desk Audit Resources for the Arkansas Funding Matrix

<table>
<tr><th>Matrix Element</th><th>Original EB Recommendation</th><th>Current Arkansas Policy</th><th>Current EB Recommendation</th><th>500 Student Prototype Resources – Current Arkansas Policy</th><th>500 Student Prototype Resources – Current EB Model</th></tr>
<tr><td colspan="6">STAFFING FOR CORE PROGRAMS</td></tr>
<tr><td>1. Kindergarten</td><td>Full day kindergarten program. Each K student counts as 1.0 pupil in the funding system</td><td>Requires districts to provide a full day kindergarten program for children who turn age 5 before August 1. Fully funded for attending students.</td><td>Full day kindergarten program. Each K student counts as 1.0 pupil in the funding system</td><td>See Core teacher resources, line 2</td><td>See Core teacher resources, line 2</td></tr>
<tr><td>2. Core class size, core teachers</td><td>K-3: 15
4-12: 25</td><td>K: 20
1-3: 23
4-12: 25</td><td>K-3: 15
4-12: 25</td><td>Number of Core Teachers[1]<table><tr><th>Grade</th><th>Number</th></tr><tr><td>K</td><td>2.00</td></tr><tr><td>1-3</td><td>5.00</td></tr><tr><td>4-12</td><td>13.80</td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>20.80</td></tr></table></td><td>Number of Core Teachers<table><tr><th>Grade</th><th>Number</th></tr><tr><td>K</td><td>2.67</td></tr><tr><td>1-3</td><td>7.66</td></tr><tr><td>4-12</td><td>13.79</td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>24.12</td></tr></table></td></tr>
</table>

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
3. Elective/Specialist/ PAM Teachers	20% of grade K-12 core teachers	20% of grade K-12 core teachers	20% of K--8 teachers 33 1/3 % of grade 9-12 teachers	**Number of Non-Core Teachers** **Grade** **Number** K-12 4.14[2] Total 4.14	**Number of Non-Core Teachers** **Grade** **Number** K-8 3.60 9-12 2.04 Total 5.64
4. Instructional Coaches/ Facilitators	1 per 200 students or 2.5 per 500 students	2.5 per 500 students, with up to 0.5 used for an AP position	1 per 200 students	2.5	2.5
5. Tutors	No base tutor positions in prototypical school. Tutor positions only enabled on the basis of the NSL Student count.	No base tutor positions in prototypical school. Tutor positions only enabled on the basis of the NSL Student count.	1 tutor position in each prototypical school[3]	No Core or Base tutors generated under current model	**Number of Core or Base Tutors** **Grade** **Number** K-8 (1:450) 0.7 9-12 (1:600) 0.3 Total 1.0

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
6. Special Education	2.9 teachers per 500 students Federal IDEA Part B (Title VI-B) funds State catastrophic aid program	2.9 teachers per 500 students Federal IDEA Part B (Title VI-B) funds State catastrophic aid program	1 teacher for every 150 students in the school 1 aide for every 150 students in the school Federal funds Full state funding for students with severe disabilities	2.9 special education teachers Federal funds State catastrophic aid	3.3 special education teachers 3.3 special education aides Federal funds State catastrophic aid
7. Substitute Teachers	$100 + social security and state retirement per day for 10 days a year for each teacher	$64.00 per pupil, which equals $133 including social security and state retirement per day for 10 days a year for each teacher	5 percent of all teacher and instructional coach positions (which provides about 10 days per teacher per year).	$64.00 per pupil	$195 per student which represents 5% of 32.26 teachers (1.613) times the FY 13 salary and benefit amount per teacher of $60,566.

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
8. Student Support/ Family Outreach	1 for each 100 NSL students. 1 for every 500 middle school students 1 for every 250 high school students	2.5 positions for every 500 K-12 students	1 guidance counselor for every 450 grade K-5 students 1 guidance counselor for every 250 grade 6-12 students 1 nurse for every 750 K-12 students	Counselors 1.11 Nurses 0.67 Other Pupil Support 0.72 Total 2.50	Counselors K-5 0.5 6-12 1.1 Nurses 0.7 Total 2.3
9. Supervisory/duty Aides	$35 per pupil intended to fund 1 supervisory aide for every 500 K-12 students	$54.70 per pupil, approximately enough to hire one supervisory aid.	1 supervisory/duty aide for every 225 K-8 students 1 supervisory/duty aide for every 200 grade 9-12 students,	$54.70 per pupil, approximately enough to hire one supervisory aid	K-8 1.5 9-12 0.6 Total 2.1

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
10. Librarian	1 librarian for prototypical 500 student middle school and 1.5 librarian positions for a 500 student high school, and no librarians for the elementary school (to be supplied via specialist/elective positions)	0.825 librarian position for the 500 student Arkansas school	1 librarian for every 450 K-8 students 1 librarian for every 600 grade 9-12 students	0.825 librarian positions for the 500 student Arkansas school	Number of Librarians K-8 0.77 9-12 0.26 Total 1.03
11. Principal/Assistant Principal	1 principal for every 500 students	1 principal for every 500 students	1 principal for every 450 K-8 students, 1 principal and 1 assistant principal for every 600 grade 9-12 students	1 principal for every 500 students	K-8 0.77 9-12 principal 0.26 9-12 AP 0.26 Total 1.29
12. School Secretaries	Included in the 2003 Carry Forward. 2006 Recalibration report recommended 2 secretary positions for every 500 students	1 secretary for every 500 students	1 school secretary for every 225 K-8 students and 1 school secretary for every 200 grade 9-12 students	1 secretary for every 500 students	K-8 1.54 9-12 0.77 Total 2.31

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
DOLLAR PER STUDENT RESOURCES					
13. Gifted and Talented	Retain extant standards and expenditure requirements. No specific funding in the Matrix	Retain extant standards and expenditure requirements. No specific funding in the Matrix	$25 per regular student	Retain extant standards and expenditure requirements. No specific funding in the Matrix	$25 per regular student
14. Professional Development	10 days of student free time for training Funds for training expenses at the rate of $50 per student	The teacher work year was expanded by 5 days to provide 10 days for PD Funded outside the matrix as a categorical program. $52 per pupil for training in FY 2013	10 days of student free time for training Funds for training at the rate of $100 per student	$26,000	$50,000
15. Technology	$250 per pupil	$250 per pupil in Act 59, now reduced to $217.60 per pupil for FY 2013	$250 pupil	$217.60 per pupil or $108,800	$250 per pupil or $125,000

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
16. Instructional Materials/ Short Cycle Assessments	2003 Report $250 per pupil 2006 Report Inst. Materials $160 per pupil Assessment $25 per pupil Total of $185 per pupil	$176.70 per pupil which is $160 per pupil increased by inflation since the 2006 study	$190 per pupil for instructional materials and $30 per pupil for assessment for a total of $220 per student The EB model also includes $10 per student for supplemental instructional and other materials for NSL tutoring, extended day, summer school, and ELL programs described below (Elements 21, 22, 23 and 24).	$88,350	$220 per pupil for a total of $110,000

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
17. Extra Duty Funds/ Student Activities	$0 per pupil grades K-5 $60 per pupil Grades 6-8 $120 per pupil grades 9-12	$55.20 per student	$200 per student for each K-8 student $250 per student for each 9-12 student.	$27,600	K-8 $69,280 9-12 $38,300 Total $107,580
CARRY FORWARD					
18. Operations and Maintenance	$1,152 per student included in the carry forward estimate	Approximately 9% of foundation funding based on a series of studies and comparisons with National study	Separate formulas for custodians, maintenance workers and groundskeepers	Per pupil amount tied to percent of foundation funding. Includes property insurance funds 2013 $629.00	2.8 custodians, 1.0 maintenance workers 0.82 groundskeepers 4.62 total Plus funds for materials and supplies of $116.73

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
19. Central Office	Included with Maintenance and Operations and transportation in an overall "carry forward" per pupil amount of $1,152	Included at a level of $415.10 with Maintenance and Operations and transportation in an overall "carry forward" per pupil amount now adjusted to $1,354	A per pupil amount calculated from a 3,900-student prototypical school district.	Districts currently spend an estimated average of $234.35 per pupil	Has ranged from $488 to $644 per pupil in recent studies in other states
20. Transportation	Included in an overall "carry forward" per pupil amount of $1,152	Included at a level of $309.90 in an overall "carry forward" per pupil amount now adjusted to $1,354	The EB does not address transportation, but recommends providing aid on a categorical basis based on multiple factors	$309 per pupil	Not addressed, but recommends providing aid on a categorical basis based on multiple factors

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
21. Tutors and Pupil Support	1 tutor position and one pupil support position for every 100 NSL students	1 position ($517 per NSL student) for districts with an NSL percentage up to 70% 2 positions ($1,033 per NSL student) for districts with NSL percentage between 70 and 90% 3 positions ($1,549 per NSL student) for districts with NSL percentage above 90%	1 tutor position and one pupil support position for every 125 at-risk (unduplicated NSL + ELL) students. These positions are provided additional days for professional development (Element 14) and substitute days (Element 7) discussed above.	Funding for extra help strategies is based on the percentage of NSL students in a district	Assuming an average of 50% of a 500 student K-12 school are unduplicated NSL plus ELL students, the school would generate 2.0 additional tutor positions and 2.0 additional pupil support positions

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
22. Extended Day	Nothing recommended in 2003 adequacy study. 2006 Recalibration study recommended (1) teacher position for every 30 NSL students (or 3.33 FTE per 100 such students). Position paid at the rate of 25 percent of 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 NSL students.	No specific formula but the funds from the NSL categorical grant could be used for extended day programming.	One (1) teacher position for every 30 at-risk students (unduplicated NSL plus ELL), or 3.33 FTE per 100 at risk students. Position paid at the rate of 25 percent of 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 at-risk (unduplicated NSL plus ELL) students	No specific formula but the funds from the NSL grant could be used for extended day programming.	Assuming an average of 50% of a 500 student K-12 school are at-risk (unduplicated NSL plus ELL) students, the school would generate 2.1 additional staff positions

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
23. Summer School	Nothing recommended in 2003 adequacy study. 2006 Recalibration study recommended (1) teacher position for every 30 NSL students (or 3.33 FTE per 100 such students). Position paid at the rate of 25 percent of annual salary—enough to pay a teacher for a six to eight week 4 hour per day summer school program and include adequate time for planning and grading This formula equates to 1 teacher position for every 120 NSL students.	No specific formula but the funds from the NSL grant could be used for extended day programming.	One (1) teacher position for every 30 at-risk students (unduplicated NSL plus ELL), or 3.33 FTE per 100 at risk students. Position paid at the rate of 25 percent of 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 at-risk (unduplicated NSL plus ELL) students	No specific formula but the funds from the NSL grant could be used for extended day programming.	Assuming an average of 50% of a 500 student K-12 school are at-risk (unduplicated NSL plus ELL) students, the school would generate 2.1s additional staff positions

Matrix Element	Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation	500 Student Prototype Resources – Current Arkansas Policy	500 Student Prototype Resources – Current EB Model
24. ELL only	0.4 FTE per 100 ELL students	$305 per ELL, or about 0.6 FTE per 100 ELL	One (1) FTE teacher position for every 100 identified ELL students.	$305 per ELL, or about 0.6 FTE per 100 ELL	One (1) FTE teacher position for every 100 identified ELL students.
25. ALE	1 teacher for every 20 ALE students	$4,228 per ALE student, which equals 1 teacher for every 14 students	1 assistant principal position plus 1 teacher position for every 7 FTE students in an alternative school program, as well as the dollar per student resources (instructional materials, technology, etc.) and Central Office and Maintenance and Operations.	$4,228 per ALE student, which equals 1 teacher for every 14 students	1 AP-level position funded plus 3 teachers for an ALE school with 21 students, plus the dollar per student resources (instructional materials, technology, etc.) and Central Office and Maintenance and Operations.

[1] Source: Bureau of Legislative Research (2014), p. 5
[2] Source: Bureau of Legislative Research (2014), p. 5
[3] Additional tutors are enabled through the at-risk (unduplicated NSL and ELL pupil counts) in Element 21
[4] Additional student support resources are provided on the basis of at-risk student counts in Element 21

STAFFING FOR CORE PROGRAMS

This section covers full-day kindergarten, core teachers, elective/specialist teachers, instru facilitators/coaches, special education, substitute teachers, student support, supervisory aic librarians, principals/assistant principals and school secretaries.

1. Full Day Kindergarten

The table below shows that both the EB model and the current AR matrix call for full day kindergarten. Details on the resources kindergarten students generate are included in the s that follow below.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Full day kindergarten program. Each K student counts as 1.0 pupil in the funding system.	Requires districts to provide a full day kindergarten program for children who turn age 5 before August 1. Fully funded for attending students.	Full day kindergarten program. Each K student counts as 1.0 pupil in the funding system.

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 g (Gullo, 2000; Slavin, Karweit & Wasik, 1994). Fusaro's (1997) late 1990s meta-analysis studies comparing the achievement effect of full-day kindergarten to half-day kindergarter programs, found an average effect size of +0.77,[1] which is substantial. Children participat full-day kindergarten programs do better in learning the basic skills of reading, writing, an mathematics in the primary grades than children who receive only a half-day program or n 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 showed that children who attended full-day kindergarten had a greater ability to demonstra reading knowledge and skill than their peers in half-day programs, across the range of fam backgrounds. Cooper, et al.'s (2010) comprehensive meta-analysis reached similar conclu finding the average effect size of students in full day versus half-day kindergarten to be +(Moreover, a *randomized controlled trial*, the "gold standard" of education research, found effect of full-day versus half-day kindergarten to be about +0.75 standard deviations (Elicl Mathur, 1997). As a result of this research, funding full day kindergarten for 5 year-olds a as for 4 year-olds is an increasingly common practice among the states (Kauerz, 2005).

[1] Effect size is the amount of a standard deviation in higher performance that the program produces for stude participate in the program versus students who do not. An effect size of 1.0 indicates that the average studen performance would move from the 50th to the 83rd percentile. The research field generally recognizes effect 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 supports a full day program for all students, by counting such students as 1.0 in the state aid formula.

2. Core Teachers/Class Size

In staffing schools and classrooms, the most expensive decision superintendents and principals make is that of class size. 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. For matrix calculations a 500-student school is assumed to have 40 students in Kindergarten and 38.3 students each in grades 1-12.

<table>
<tr><th>Original
EB Recommendation</th><th>Current Arkansas Policy</th><th>Current
EB Recommendation</th></tr>
<tr><td>K-3: 15
4-12: 25</td><td>K: 20
1-3: 23, with a max. of 25
4-6: 25, with a max. of 28
7-12: 25, with a max. of 30</td><td>K-3: 15
4-12: 25[2]</td></tr>
<tr><td></td><td>500-student Prototype Resources – Current Arkansas Policy
Number of Core Teachers[1]
<table>
<tr><th>Grade</th><th>Number</th></tr>
<tr><td>K</td><td>2.00</td></tr>
<tr><td>1-3</td><td>5.00</td></tr>
<tr><td>4-12</td><td>13.80</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>20.80</td></tr>
</table></td><td>500-student Prototype Resources – Current EB Model
Number of Core Teachers
<table>
<tr><th>Grade</th><th>Number</th></tr>
<tr><td>K</td><td>2.67</td></tr>
<tr><td>1-3</td><td>7.66</td></tr>
<tr><td>4-12</td><td>13.79</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total</td><td>24.12</td></tr>
</table></td></tr>
</table>

[1] Source: Bureau of Legislative Research (2014), p. 5

[2] For grades K-5 this averages approximately 18 per grade so Arkansas policy can meet or exceed the state's class size recommendation for all grades

Analysis and Evidence

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 persisted 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 roughly 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 many states have recommended secondary class sizes of 20, none cited research or best practices to support such a proposal.

Citing more recent studies Whitehurst and Chingos (2011) argue that there might be a modest linear relationship between class sizes from 25-30 down to 15, but our view of the evidence and impact is that both are modest at best and insufficient to alter the EB class size formulas.

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."

We consistently recommend that states fund all other elements of the EB model before putting funds into the class size recommendations displayed above. We have made this recommendation because research shows many other components of the EB model are more cost effective in terms of improving student performance – particularly for improving the performance of struggling students.

Practice in Arkansas aligns with this recommendation. In creating Act 59, the legislature deferred to the state's accreditation standards, when it established class sizes for core teachers in the Arkansas matrix. The State Supreme Court accepted that approach in its review of the matrix. Further, since the state standards allow maximum class sizes to be 25 in grades 1-3, 28 in grades 4-6 and 30 in grades 7-12, funding the matrix at lower class sizes provides additional staffing flexibility to school districts.

Resource Use Analysis

The Bureau of Legislative Research report on resource allocation indicates that the state's data system does not allow for analysis of classroom teachers by the type of courses they teach (p.13). Consequently data presented in the report include both core and elective teachers. For this reason, our analysis of resource use follows the discussion of elective teachers immediately below.

3. Elective/Specialist/PAM Teachers

In addition to core classroom teachers, the EB model provides additional elective or specialist teachers to support core teachers. This allows time during the school day for core teachers to collaborate on instructional plans, participate in professional development activities and otherwise plan for class instruction. Generally, non-core or elective teachers (also called specialist teachers in the Odden Picus & Associates reports) offer courses such as music, art and PE.

<table>
<tr><th>Original
EB Recommendation</th><th>Current Arkansas Policy</th><th>Current
EB Recommendation</th></tr>
<tr><td>20% of grade K-12 core teachers</td><td>20% of grade K-12 core teachers</td><td>20% of K--8 teachers
33 1/3 % of grade 9-12 teachers</td></tr>
<tr><td></td><td>500-student Prototype Resources – Current Arkansas Policy
No. of Elective Teachers
<table><tr><th>Grade</th><th>Number</th></tr><tr><td>K-12</td><td>4.14[2]</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>4.14</td></tr></table></td><td>500-student Prototype Resources – Current EB Model
No. of Elective Teachers
<table><tr><th>Grade</th><th>Number</th></tr><tr><td>K-8</td><td>3.60</td></tr><tr><td>9-12</td><td>2.04</td></tr><tr><td></td><td></td></tr><tr><td>Total</td><td>5.64</td></tr></table></td></tr>
</table>

[2] Source: Bureau of Legislative Research (2014), p. 5

Analysis and Evidence

In addition to the core subjects addressed above, schools need to provide a solid well-rounded curriculum including art, music, library skills 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 since we completed our 2006 Arkansas study, we have developed a different argument for high schools. If the goal is to have more high school students take a core set of rigorous academic courses, and learn the course material at a high level of thinking and problem solving, cognitive research findings suggest that use of longer class periods, such as a block schedule, is a better way to organize the instructional time of a high school. (Bransford, Brown and Cocking, 1999; Donovan & Bransford, 2005a, 2005b, 2005c). Typical block scheduling for high schools includes 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 schedule requires elective teachers at a rate of 33 1/3 percent of the number of core teachers. This block schedule would operate 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 as elective teachers to provide the regular teacher with a "block" for planning, preparation and collaboration each day.

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 throughout grades 9-12, and an appropriate number of classes for the 22.5 credits required for high school graduation as indicated in the table below:

High School Graduation Requirements	
Subject	**Required Credits**
Mathematics	4
English	4
Natural Science	3
Social Studies	3
Economics	0.5
Oral Communication	0.5
Physical Education	0.5
Health and Safety	0.5
Fine Arts	0.5
Career Focus	6
Total Units	**22.5**

In both 2003 and 2006 we argued that a six period high school schedule would still allow students to earn sufficient credits for high school graduation. However, for accreditation, Arkansas requires high schools to provide instruction for 38 units in grades 9-12. At that time, we also suggested that the large number of units for career focus could be reduced. This argument is stronger today when the argument is that all students need a rigorous high school education to be college and career ready.

We note that the elective teacher 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 instruct for only 5 of those periods. We do not resource schools at that level 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 is not a strategy that is likely to 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 is 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.

Resource Use Analysis[2]

Review of the tables comparing core and non-core teacher allocations for the Arkansas matrix with the EB model shows that the EB generates 4.82 more total teachers for core and non-core instruction than the ratios currently in place in the Arkansas matrix. This is displayed in the following table.

500-student Prototype Resources – Current Arkansas Policy		500-sudent Prototype Resources – Current EB Model	
Number of Teachers		Number of Teachers	
Type	**Number**	**Type**	**Number**
Core	20.80	Core	24.12
Non-Core	4.14	Non-Core	5.64
Total	24.94	Total	29.76

Of more importance is how districts currently use the funding generated to pay for classroom teachers. Our analysis of teachers for both core and non-core classes is considered for all grade levels, K-12, because the State's data reporting system does not disaggregate classroom teachers by the subject taught. The Bureau of Legislative Research 2014 report shows that the average number of combined classroom teachers employed by districts with foundation funds (24.6 per 500 students) is just slightly lower than the staffing level established in the funding matrix (24.9) and that a non-material number additional staff were funded by resources outside the foundation program.

The staffing patterns in 2012-13 differed across districts of varying size and poverty levels as follows:

- Size
  - Large districts (>5,000 students) used foundation funding to hire 22.7 teachers for every 500 students – less than the funding formula level of 24.94
  - Medium size districts (750-5,000 students) provided about one teacher more (25.8) than the funding formula
  - Small districts (<750 students) hired just over three teachers more (28.0) than the funding formula provides for every 500 students.
- Poverty level (foundation funds only)
  - Low poverty (<70%) districts employed 24.8 teachers per 500 students
  - Medium poverty districts (70-90%) employed 25 teachers per 500 students
  - High poverty districts (>90%) employed 26.8 teachers per 500 students.

[2] All data for the resource analysis are taken from the most recent analysis of spending patterns by the elements of the funding matrix (Bureau of Legislative Research, 2014).

4. Instructional Facilitators/Coaches

Coaches, or instructional facilitators 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 (Cornett & Knight, 2008; Crow, 2011; 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. The few instructional coaches who also function as school technology coordinators 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. We expand on the rationale for these individuals in the section on professional development, but include them here as they represent teacher positions.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 per 200 students or 2.5 per 500 students	2.5 per 500 students, with up to 0.5 used for an AP position	1 per 200 students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	2.5	2.5

Analysis and Evidence

Only a few states (e.g., Arkansas, New Jersey, Wyoming and to a modest degree North Dakota) explicitly provide resources for school and classroom-based instructional coaches, yet instructional coaches are key to making professional development work (see Element 14). 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).

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, several technology-heavy school 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.

Although instructional coaching positions are identified as FTE positions, schools could divide the responsibilities across several individual teachers. For example, the 2.5 positions in a 500-student school could be structured with teacher/instructional coaches. In this example, each teacher/coach would work 50 percent time as a coach – perhaps in one curriculum area such as reading, math, science, social studies and technology – and 50 percent time as a classroom teacher or tutor.

We note that this level of staffing for coaches, 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, providing a solid foundation of high quality instruction for everyone, including students who struggle more to learn to proficiency.

Resource Use Analysis

The 2014-resource allocation report prepared by the Bureau of Legislative Research shows that the average number of instructional coaches employed by districts with foundation funds (0.9 per 500 students) is less than the staffing level established in the funding matrix (2.5). This means that on average teachers have much less access to instructional coaching than the funding system would allow.

The staffing patterns differed across districts of varying size and poverty levels as shown below:

- Size
    - Large districts (>5,000 students) used foundation funding to hire just 1.1 instructional coaches for every 500 students
    - Medium size districts (750-5,000 students) provided even fewer coaches (0.9 per 500 students
    - Small districts (<750 students) hired the least number of instructional coaches teachers (0.4) for every 500 students.
- Poverty
    - Low poverty (<70%) districts employed 0.91 coaches per 500 students
    - Medium poverty districts (70-90%) employed 1.0 coaches per 500 students
    - High poverty districts (>90%), those with the toughest instructional challenges, employed fewer coaches (0.71 per 500 students).

In the case of poverty levels, districts employed substantially fewer coaches than the foundation formula provides.

5. Tutors/Tier 2 Intervention

The most powerful and effective approach for helping students struggling to meet state standards is individual one-to-one or small group (3 to 1 or 5 to 1) tutoring provided by licensed teachers (Shanahan, 1998; Wasik & Slavin, 1993). In our 2003 and 2006 reports we recommended allocation of tutors to schools on the basis of the number of NSL students (NSL serving as a proxy for the number of struggling students). Since that time, we have recognized that all schools benefit from the services of a tutor and have modified the EB model so that a prototypical school receives at least one tutor regardless of the number of poverty (NSL in Arkansas) students. *Consequently, we identify the minimum tutor resources a school receives under the current EB model here in the core staffing section and provide more detail (and support for their allocation and use in the struggling students section – specifically Element 21 below.*

<table>
<tr><th>Original
EB Recommendation</th><th>Current Arkansas Policy</th><th>Current
EB Recommendation</th></tr>
<tr><td>No base tutor positions in prototypical school. Tutor positions only enabled on the basis of the NSL Student count.</td><td>No base tutor positions in prototypical school. Tutor positions only enabled on the basis of the NSL Student count.</td><td>1 tutor position in each prototypical school[3]</td></tr>
<tr><td></td><th>500-student Prototype Resources – Current Arkansas Policy</th><th>500-student Prototype Resources – Current EB Model</th></tr>
<tr><td></td><td>No Core or base tutors generated under current model</td><td>Number of Core Tutors<table><tr><th>Grade</th><th>Number</th></tr><tr><td>K-8 (1:450)</td><td>0.7</td></tr><tr><td>9-12 (1:60-0)</td><td>0.3</td></tr><tr><td>Total</td><td>1.0</td></tr></table></td></tr>
</table>

[3]Additional tutors are enabled through the NSL pupil count in Element 21.

Analysis and Evidence

In our 2003 and 2006 reports, we recommended tutor position be provided only on the basis of poverty, as measured by NSL student counts. The recommended ratio was one position for every 100 NSL students. As a result schools without any NSL students would receive no resources for struggling students, and thus no resources for Tier 2 interventions. Since that time, educators and policymakers across the country have argued that schools with few low-income students still have students who struggle to learn to proficiency, and that such students will likely increase with the more rigorous college and career ready standards. We agree that those students should have some level of tutor/Tier 2 intervention services as well.

Consequently we have revised the EB model to provide one tutor/Tier 2-intervention position in each prototypical school. In parallel with that change, we adjusted the ratio for additional tutor positions to one position for every 125 NSL students. The additional support beyond the first tutor per prototypical school is described in detail in Section 21(struggling students) below.

We provide evidence on the rationale for and effectiveness of tutoring in Element 21 in the section below on resources for struggling students. Here we note here two recent *randomized controlled trials* of the effectiveness of tutoring for struggling students, which support our logic for providing a minimum level of tutor support in all schools. At the elementary level, May et al., (2013), using a randomized controlled trial, assessed the impact of tutors in a Reading Recovery program. In the third year of a five-year evaluation, they found that Reading Recovery tutoring had an effect size of 0.68 on overall reading scores relative to the population of students eligible for such services in the specific study, and a 0.47 effective size relative to the national population of first grade struggling readers. The effects were similarly large for reading words and reading comprehensive sub-scales.

For students in high schools, Cook, et al. (2014) reported on a *randomized controlled trial* of a two-pronged intervention that provided disadvantaged youth with tutoring and counseling. They found that intensive individualized academic extra help – tutoring – combined with non-academic supports seeking to teach grade 9 and 10 youth social-cognitive skills based on the principles of cognitive behavioral therapy (CBT), led to improved math and reading performance. The study sample consisted mainly of students from low income and minority backgrounds, which generally pose the toughest challenges. The effect size for math was 0.65 and for reading was 0.48; the combined program also appeared to increase high school graduation by 14 percentage points (a 40% hike). The authors concluded that this intervention seemed to yield larger gains in adolescent outcomes per dollar spent than many other intervention strategies.

We highlight these studies here for several reasons. First, they represent new, *randomized controlled trials*, the "gold standard" of research on what works. Second, they show that tutoring can work not only for elementary but also for high school students, whereas most of the tutoring research addresses elementary-aged students. Third, they show that tutoring can work even in the most challenging educational environments. And fourth, they bolster the EB argument below that extra help resources in schools triggered by poverty should also include some non-academic, counseling resources as well, as the treatment in the second study was tutoring combined with a counseling.

Resource Use Analysis

The Bureau of Legislative Research 2014 report does not include a specific analysis of tutors as the Arkansas matrix does not specifically fund that position. Because the 2003 and 2006 adequacy studies recommended tutors only in relation to NSL counts, there was no minimum number of tutors established in those reports. Moreover, categorical funding for NSL students is based on the percentage of NSL students in a district. Although the uses of the funds generated by district NSL counts are restricted, districts still have wide latitude on how to spend the funds –

thus districts choose to utilize the funds (and the staff those funds pay for) in a variety of different ways. A specific tutor category is not present in the funding or reporting system.

Today the EB model recommends a minimum of one tutor for a school of 500 students.

6. Special Education

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, often those associated with students learning to read, are correctable through strategic early intervention. This intervention includes effective core instruction as well as targeted Tier 2 intervention programs, particularly one-to-one tutoring (Element 21). For those that require special programs as identified through an IEP, the EB model relies on a census based funding formula that provides additional teaching and aid resources based on the *total* number of students in a school. As described below, these resources are expected to meet the instructional needs of children with mild and moderate disabilities. For children with severe disabilities, the EB model assumes the state pays the entire cost of their program.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
2.9 teachers per 500 students Federal IDEA Part B (Title VI-B) funds State catastrophic aid program	2.9 teachers per 500 students Federal IDEA Part B (Title VI-B) funds State catastrophic aid program	1 teacher for every 150 students in the school 1 aide for every 150 students in the school Federal funds Full state funding for students with severe disabilities
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	2.9 special education teachers Federal funds State catastrophic aid	3.3 special education teachers 3.3 special education aides Federal funds State catastrophic aid

Analysis and Evidence

In their 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 pullout 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).

Supporting this argument, 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 with interventions of this type (see for example, Levenson, 2011; Madden, Slavin, Karweit, Dolan & Wasik, 1993; Slavin, 1996).

That is why the EB recommendations for extended learning opportunities (Elements 21, 22 and 23) 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 professional development and strong leadership from the district office and the site principal. Using a census approach to providing most of extra resources for students with disabilities, the current Arkansas approach – which is the approach increasing in use 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 "pullout" 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.

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.

The census approach to funding core special education services, of which Arkansas was one of the early adopter states, can be accomplished by providing additional teacher resources at a fixed level – the EB recommendation now is 1.0 teacher and 1.0 aide for every 150 regular student. The census approach 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

Allocating a fixed census level of staffing (1.0 FTE teachers and 1.0 FTE aides for every 150 students) could 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 at-risk students discussed for Elements 21-23– tutoring, extended day, summer school and ELL -- meets this requirement.

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. This is the catastrophic funding for school districts that provides resources for special education students who require services exceeding $15,000 (after Medicaid, federal special education grants, and other available third-party funding is applied).

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.

Resource Use Analysis

In funding the matrix support level of 2.9 special education teachers per 500 students, the actual staffing ratio for 2012-13 totaled 2.95 special education teachers per 500 students, which as noted by the Bureau of Legislative Research, "is just slightly more than the staffing levels established in the matrix (p.24)."

Actual staffing for special education was generally close to the ratio in the matrix with small schools having 2.69 special education teachers, medium size schools 2.87 special education teachers and large schools 3.14 special education teachers per 500 students. When analyzed by poverty, low poverty schools (<70%) had 3.0 special education teachers, medium poverty (70-90%) had 2.86 special education teachers and high poverty (90% +) had 2.56 special education teachers per 500 students.

The Bureau's analysis does not include special education aides, which were not part of the funding matrix. The EB model today provides more teachers (3.3) per 500 students and also

would provide funding for 3.3 special education aides per 500 students. This would result in substantially more funding to hire special education staff.

7. Substitute Teachers

Schools need some level of substitute teacher allocations in order to cover classrooms when teachers are sick for short periods of time, absent for other reasons, or on long term sick or pregnancy leave, etc. In many other states, substitute funds are budgeted at a rate of about ten days for all teachers. The current EB model approach of providing funding equal to five percent of the cost of teacher salaries approximates that ten-day figure.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
$100 + social security and state retirement per day for 10 days a year for each teacher	$64.00 per pupil, which equals $133 including social security and state retirement per day for 10 days a year for each teacher	5 percent of all teacher and instructional coach positions (which provides about 10 days per teacher per year).
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$64.00 per pupil	$195 per student which represents 5% of 32.26 teachers (1.613) times the FY 13 salary and benefit amount per teacher of $60,566.

Analysis and Evidence

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 short periods, 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 student free days for professional development; the professional development recommendations are fully developed in a separate section below (Element 13).

Resource Use Analysis

When the matrix-funding model was implemented, the Legislature funded substitutes at a lower rate than recommended in the 2003 adequacy study. The rate was established at a base salary of $75 per day, which amounted to $59 per day plus benefits. For 2013-14 the rate is $65.20 ($64 in 2012-13) per pupil, which supports an average daily rate of $107 plus 22% in benefits (Bureau

of Legislative Research, 2014). Districts received a total of $29.2 million for substitutes in 2012 and spent $30.7 million that year. The Bureau survey also determined that the average daily rate for substitutes who were certified teachers was $73.57 a day when districts hired them directly and $76.01 per day when a placement company was used. Moreover, only two districts paid the health care match for substitutes in 2012-13. It is likely that the Affordable Care Act employer mandates will require most districts to either pay the health care match for 2014-15 or rely more heavily on placement companies that charge more, but will enable the district to avoid direct payment of the health care premiums.

The EB model provides funding for five percent of a schools core and elective teachers and coaches. There are a total of 32.26 such positions. Five percent of that is 1.613 substitute teachers for a 500-student school, which at the FY salary and benefit figure of $60,566 generates $95,693 or $195.38 per pupil.

8. Student Support/Family Outreach

Core student support services include tutors for struggling students, guidance counselors and nurses. The current matrix provides funding for these positions as part of the core staffing as detailed in the table below. The current EB model provides resources for core student support personnel here as well as additional pupil support personnel to help with struggling students based on poverty and ELL rates as described in Element 21 below.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 for each 100 NSL students. 1 for every 500 middle school students 1 for every 250 high school students	2.5 positions for every 500 K-12 students	1 guidance counselor for every 450 grade K-5 students 1 guidance counselor for every 250 grade 6-12 students 1 nurse for every 750 K-12 students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	Counselors 1.11 Nurses 0.67 Other Pupil Support 0.72 Total 2.50	Counselors K-5 0.5 6-12 1.1 Nurses 0.7 Total 2.3

[4] Additional student support resources are provided on the basis of student poverty rates in Element 21.

Analysis and Evidence

Schools need a student support and family outreach strategy. For student support such as guidance counselors, the EB model uses the standards from the American School Counselor Association (ASCA), which today is one counselor for every 250 secondary (middle and high school) students. This produces about 1.1 positions for the approximately 268 grade 6-12 students in the Arkansas 500-student school. Because most states also require a guidance counselor in elementary schools, and many elementary schools also hire guidance counselors, the EB model also includes one guidance counselor at that level, which approximates to 0.5 positions for the K-5 students in the Arkansas 500-student K12 school.

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; this produces another 0.7 positions for the 500-student Arkansas school. Combined, these approximately 2.3 pupil support positions. The EB model provides additional pupil support personnel to schools on the basis of at-risk student counts as described in Element 21 below.

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.

Resource Use Analysis

The table below summarizes the current use of pupil support staff in Arkansas in 2012-13 in comparison to the current Arkansas matrix, and use of pupil support staff by district size and poverty levels.

Support Staff and District Type Category	Current Matrix Allocation	Current District Practice
Guidance Counselors	1.11	1.14
By District Size		
Small	Not Determined	1.16
Medium	Not Determined	1.18
Large	Not Determined	1.07
By Poverty Level		
Low	Not Determined	1.15
Medium	Not Determined	1.10
High	Not Determined	1.12

9. Supervisory and Instructional Aides

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
$35 per pupil intended to fund 1 supervisory aide for every 500 K-12 students	$54.70 per pupil, approximately enough to hire one supervisory aid.	1 supervisory/duty aide for every 225 K-8 students 1 supervisory/duty aide for every 200 grade 9-12 students,
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$54.70 per pupil, approximately enough to hire one supervisory aid	K-8 1.5 9-12 0.6 Total 2.1

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 2), the Tennessee STAR study, which produced solid evidence through field-based *randomized controlled trials* that small classes work in elementary schools, also produced evidence that instructional aides in schools do not add instructional value, i.e., do not positively impact student 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.

Resource Use Analysis

The EB model supports two supervisory aides at a prototypical elementary and middle school and three aides at a prototypical middle school. In 2003, the Arkansas Legislature appropriated $35 per student to fund one supervisorial aide at each 500-student prototypical school. Our 2006 report suggested a need for two such aides at each 500-student school and argued that funding for this would amount to $98.70 per student. The Legislature appropriated $46.55 per pupil, an amount then estimated to be adequate to fund one supervisory aide. Today the matrix provides $54.70 per pupil to fund the one supervisory aide. If the state were to move to the EB recommendations, funding would slightly more than double to provide 2.1 supervisory aides at each school across the state.

10. Librarians

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.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 librarian for prototypical 500-student middle school and 1.5 librarian positions for a 500-student high school, and no librarians for the elementary school (supplied via specialist/ elective positions)	0.825 librarian position for the 500-student Arkansas school	1 librarian for every 450 K-8 students 1 librarian for every 600 grade 9-12 students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	0.825 librarian positions	K-8 0.77 9-12 0.26 Total 1.03

Analysis and Evidence

There is scant research on the impact of school librarians on student achievement. In 2003, however, six states conducted studies of the impacts of librarians on student achievement: Florida, Minnesota, Michigan, Missouri, New Mexico, and North Carolina. And, in 2012 Colorado conducted a statewide study using data from 2005-2011. The general finding is that, regardless of family income, children with access to endorsed librarians working full time perform better on state reading assessments (Rodney, M.J., Lance, K.C. & Hamilton-Rennell, C, 2003; Lance, K.C. & Hofschire, L, 2012). The Michigan study found that regardless of whether the librarian was endorsed, student achievement was better for low-income children, but having an endorsed librarian was associated with higher achievement than having an unendorsed librarian (Rodney, M.J., Lance, K.C. & Hamilton-Rennell, C, 2003). Each state examined the issue differently, but library staffing and the number of operating hours were generally associated with higher academic outcomes. The EB Model recommendation for library staff is derived from best practices in other states, state statutes where they exist and the above research.

Resource Use Analysis

In 2012-13, school districts funded approximately 0.91 librarians per 500 students, slightly more than funded in the matrix. The EB model would provide approximately 0.2 more librarians for a 500-student prototypical school than is currently in the funding matrix. The Arkansas matrix provides 0.825 librarians for the 500-student school, while the current EB model would provide 0.77 FTE librarian staff for K-8 enrollments and 0.26 for 9-12 enrollments for a total of 1.03 librarians.

11. Principals and Assistant Principals

Every school unit needs a principal. There is no research evidence on the performance of schools with or without 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.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 principal for every 500 students	1 principal for every 500 students	1 principal for every 450 K-8 students, 1 principal and 1 assistant principal for every 600 grade 9-12 students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	1 principal	K-8 0.77 9-12 principal 0.26 9-12 AP 0.26 Total 1.29

Analysis and Evidence

There is no research evidence on the performance of schools with or without a principal. Few if any comprehensive school designs for 500 students include assistant principal positions. And very few school systems around the country provide assistant principals to schools with 500 or fewer students. The EB model also recommends 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 one assistant principal for the high school largely for discipline and athletics.

Resource Use Analysis

The Arkansas matrix provides one principal for a 500-student school. Arkansas school districts employ principals at virtually the same rate as funded in the matrix. In 2012-13 school districts employed 0.99 principals per 500 students. Today our EB model recommends 1.29 school site administrators for a 500-student K-12 school. Virtually all of the difference between today's EB recommendation and our 2003 and 2006 studies has to do with the addition of an assistant principal in the prototypical high school. This would generate 0.26 FTE assistant principal positions for the 153.2 estimated 9-12 students (at the average enrollment per grade of 38.3) in a 500-student school.

12. School Site Secretarial Staff

Every school site needs secretarial support to provide clerical and administrative support to administrators and teachers, to answer the telephone, greet parents when they visit the school, help with paper work, etc.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Included in the 2003 Carry Forward. 2006 Recalibration report recommended 2 secretary positions for every 500 students	1 secretary for every 500 students	1 school secretary for every 225 K-8 students and 1 school secretary for every 200 grade 9-12 students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	1 secretary	K-8 1.54 9-12 0.77 Total 2.31

Analysis and Evidence

The secretarial ratios included in the EB model are derived from common practices across the country.

Resource Use Analysis

The 2003 adequacy report included school clerical staff in the carry forward component of the funding model. In our 2006 report we recommended 2.0 secretaries for the prototypical 500-student school. The Legislature agreed that secretaries should be removed from the carry forward and funded separately, but elected to only fund one position per prototypical schools. This compares to the 2.31 secretarial positions the Arkansas K-12, 500-student school would generate under the current EB model. That figure is 0.31 FTE higher than the recommendation made in the 2006 report. And it turns out that Arkansas districts spend about 55 percent more for school secretaries than the funding provided by the matrix.

DOLLAR PER STUDENT RESOURCES

This section addresses areas that are funded by dollar per student amounts, including gifted and talented, professional development, computers and other technology, instructional materials and supplies, extra duty/student activities.

13. Gifted and Talented Students[3]

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.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Retain extant standards and expenditure requirements. No specific funding in the Matrix	Retain extant standards and expenditure requirements. No specific funding in the Matrix	$25 per regular student
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	Retain extant standards and expenditure requirements. No specific funding in the Matrix	$25 per regular student

Analysis and Evidence

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

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

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 & 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 students 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, resources for which are provided by Professional Development (Element 19).

The primary approach to serve gifted students in high schools is to enroll them in advanced courses, such as advanced placement (AP) and 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.

Resource Use Analysis

Current Arkansas practice remains as the use of the existing standards for gifted and talented students with no specific funding provided in the matrix. The EB model continues to

recommend $25 per student in each school/district as a number adequate to fund gifted and talented programs for students.

14. Intensive Professional Development

Professional development (PD) includes a number of important components. This section describes the specific dollar resource recommendations the EB model provides for PD. In addition to the resources listed here, PD includes the instructional coaches described in Element 4 and the collaborative planning time provided by the provisions for elective or specialist teachers. Those staff positions are critical to an adequate PD program along with the resources identified in this section.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
10 days of student free time for training Funds for training expenses at the rate of $50 per student	The teacher work year was expanded by 5 days to provide 10 days for PD Funded outside the matrix as a categorical program. $52 per pupil for training in FY 2013	10 days of student free time for training Funds for training at the rate of $100 per student
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	FY 2013 -- $26,000 FY 2014 -- $26,500 FY 2015 -- $16,200	$50,000

Analysis and Evidence

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 student learning and reducing achievement gaps (Odden, 2011a; Raudenbusch, 2009). 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.

An ongoing, comprehensive and systemic professional development strategy 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, writing, history and science, the professional development resources in the EB model are adequate to address the instructional needs for gifted and talented, special education, 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, discussed above for Element 3.

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 that 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 content focus today should emphasize content for college and career ready curriculum standards.
- 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, with guidance provided by instructional coaches. 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 rigorous curriculum standards and programs designed to ensure all students are college and career ready when they 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 student free time for training
- Funds for training at the rate of $100 per student

These resources are in addition to:

- Instructional coaches (Element 4)
- Collaborative work with teachers in their schools during planning and collaborative time periods (Element 3)

Resource Use Analysis

Funds for professional development (beyond coaches and five additional days for teacher contracts) are treated as a categorical program outside of the matrix. Funding levels for FY 2010 through FY 2015 are in the table below. This compares to the EB recommendation of $100 per pupil that generates $50,000 for a 500- student school in each of the years displayed below.

Fiscal Year	Amount Per Pupil	Amount for a 500 Student K-12 School	EB Model at $100 Per Pupil
2010	$50.00	$25,000	$50,000
2011	$50.00	$25,000	$50,000
2012	$51.00	$25,500	$50,000
2013	$52.00	$26,000	$50,000
2014	$53.00	$26,500	$50,000
2015	$32.40	$16,200	$50,000

15. Technology and Equipment

Over time, schools need to embed technology in instructional programs and school management strategies. Today, more and more states, now including Arkansas, require 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" or "the flipped classroom" models, such as Rocketship, have also emerged (Whitmire, 2014). 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 (Whitmire, 2014). Moreover, they can be less costly than traditional public schools (Battaglino, Haldeman & Laurans, 2012; Odden, 2012).

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
$250 per pupil	$250 per pupil in Act 59, now reduced to $217.60 per pupil for FY 2013	$250 pupil
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$217.60 per pupil or $108,800	$250 per pupil or $125,000

Analysis and Evidence

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 (15) identifies only direct technology costs, as the indirect costs, which are primarily training, are included in the overall professional development resources (Element 14). Districts also need individuals to serve as technical support for technology embedded curriculum and management systems, 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-time costs.

We also note that each district and school situation is unique and should be described in its technology plan. All Arkansas school districts have technology plans. These documents, if up-to-date, 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, then Chief Financial Officer of the South Pasadena School District in California. That analysis estimated four categories of technology costs that totaled $250 a student. 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 student 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 student figure would be sufficient for schools 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 original analysis of the $250 per student figure in 2006 allowed a school to have one computer for every two to three students. This ratio was 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. Over the last few years, computer makers have developed alternative products, such as netbooks and Chromebooks, that have a lower entry price point of about $350 per unit compared to the $700 to $800 cost for laptop or desktop computers. For school districts that value lowering the student-to-computer ratio, purchase of these devices provides an opportunity to significantly increase the number of student devices when replacing traditional units at the end-of-their-life.

As the ratio of these new devices to traditional devices increases there will be opportunity for districts to explore one-to-one student-to-computer ratios at key grade levels. As high stakes computerized testing is pushed further into the primary grade levels, moreover, it is essential that students are able to comfortably use computers to demonstrate their knowledge. If students have not had sufficient practice with computers in a testing environment, computerized testing can become a barrier to successfully assessing student achievement. If students cannot comfortably type, text responses become more of a test of "hunt and peck" skills than a reflection of the student to respond to a prompt.

Though Chromebooks use a different operating system than typically used in the educational environment, most instructional and interactive testing software is browser based, making the instructional software agnostic regarding operating systems. Additional software is being continually developed for these new platforms as they become more commonly used in the educational space. Chromebooks and other such platforms are still not appropriate for the school site or district administrative office functions.

Taking the factors above into consideration, and recognizing that the average cost of computer units can change if new, less expensive platforms are incorporated into the instructional setting, the EB model continues to recommend the $250 per student cost. This figure will permit districts to move closer to a one-to-one student-to-computer ratio.

In the past we have recommended that 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 to fix broken computers. On the other hand, when districts analyze the cost of warranty programs for Chromebooks or similar low cost hardware, they may find that it is more practical to replace broken machines than to pay for extended warranties.

As the number of computers in schools increases, it becomes more impractical to hard-wire connections into classrooms or other instructional spaces. Wireless connectivity is the only solution to creating an instructional environment for which Internet access is available anywhere, anytime on campus. Depending on campus configuration, it is possible to serve a small group of wireless computers with just a few wireless access points. However, as the number of computers being simultaneously used increases, additional access points must be added.

Our original $250 per pupil figure included modest funds to complete small on-campus infrastructure improvements. This remains the case in our EB recommendation for technology, which remains at $250 per pupil for site-based technology.

In computing the funding matrix, Arkansas has used a deflator factor in recalibrating the cost of technology decreasing the original $250 per pupil funding figure to $217 today, essentially removing the ability of districts to innovate beyond their basic technology needs. While general computer and server costs have declined, other technology costs have risen: for example, the need for bandwidth has increased, the older network switches with speeds of 100 megabits have been replaced with gigabit switches which cost the same as a 100 megabit seven years ago. If Arkansas can fully fund technology to the $250 per pupil for technology, districts will be able to gradually upgrade necessary network equipment within their campuses and eventually will be able to lower their student-to-computer ratio to a 2-1, and in some cases, 1-to-1 average.

The costs of the broadband connectivity that is required to provide districts and school sites adequate bandwidth is discussed in Chapter 3.

Resource Use Analysis

The Arkansas Legislature appropriated $250 per pupil for technology based on the 2003 EB report. As described above, the EB recommendation for technology remains at $250 per student to enable districts and schools to innovate with technology and to provide additional capacity to enhance student learning.

Since 2003, the figure used to fund the matrix has been reduced to $217.60 per pupil as the costs of technology have declined generally. This amounts to a funding difference of $16,200 per 500-student school. However, in 2013, districts spent only $24.3 million of foundation funding on technology, or $75.13 per student, less than the $99.5 million provided by the funding matrix.

16. Instructional Materials and Formative/Short Cycle Assessments

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 (Ravitch, 2004). Up-to-date instructional materials are expensive, but vital to the learning process. Researchers estimate that up to 90 percent of classroom activities is 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.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
2003 Report $250 per pupil 2006 Report Inst. Materials $160 per pupil Assessment $25 per pupil Total of $185 per pupil	$176.70 per pupil which is $160 per pupil increased by inflation since the 2006 study	$190 per pupil for instructional materials and $30 per pupil for assessment for a total of $220 per student The EB model also includes $10 per student for supplemental instructional and other materials for NSL tutoring, extended day, summer school, and ELL programs described below (Elements 21, 22, 23 and 24).
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$88,350	$220 per pupil for a total of $110,000

Analysis and Evidence

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 band is notable at $120 per book. Though the

cost of textbooks has remained relatively constant since the 2006 recalibration, many textbook companies have begun to offer an electronic version of their textbook. Many of these electronic versions are offered in a time-bound contract somewhat similar to library resource contracts to content databases. Although the common hope has been that electronic textbooks would be priced at levels that would be significantly lower than the paper-based texts, that has not been the case. Most electronically based materials from standard publishers are the same price or are only marginally discounted by 10% to 20%. Moreover, many publishers offer to sell the paper-based texts with the electronic version for a 20% to 30% premium. That electronic version is also time-bound. Further, until schools have reached a one-to-one student-to-computer ratio, it is not practical to rely on an exclusively electronic-based textbook.

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. Until repealed by Act 511 in 2013, Arkansas had a typical six-year adoption cycle for textbooks. 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.

Year	2014	2015	2016	2017	2018	2019
Content Area	Social Studies	Science	Fine Arts	English Language Arts	Computer Science	Math
	Arkansas History	Foreign Language	SPED	Journalism		
	CTE Driver's Education		CTE (Various)			

In some years, at the elementary level, there are subject areas that pertain more to the secondary levels. In these years, the funds for instructional materials provide the opportunity for purchasing not only additional supplementary texts but also consumables/pedagogical aides.

Library Funds. The National Center for Educational Statistics reports that the average national per student expenditure for library materials in the 2010-11 school year was $16 (excluding library salaries) (NCES, 2013). Over 90% of the $16 was spent on book titles and only 10% on other resources such as subscription databases. This is a change from the 40% that was spent on book titles and 60% on other resources in 2005 by Michie and Holton (2005), demonstrating a possible shift back to printed materials. The reallocation between printed materials and other resources such as electronic databases, the amount per student has remained unchanged despite inflationary factors for many years. The NCES figures are based on self-reported responses to NCES surveys.

Over the last 10 years, libraries have purchased subscriptions or used electronic databases such as online catalogs, the Internet, reference and bibliography databases, general article and news

databases, 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). Based on the reallocation of spending back to book titles, the move to electronic databases appears to have slowed and/or even decreased. This could be due to various factors such as the rise in free services and online resources such as the Khan Academy and Wikipedia.

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

Inflating these numbers to adequately meet the needs of the school libraries, the EB model includes funding of $20 per student for elementary and middle schools and $25 per student for high schools to pay for library texts 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).

Move to the Common Core. Arkansas has committed itself to full implementation of the Common Core State Standards (CCSS) for the 2014-15 school year. Access to standards-aligned instructional resources for teachers and students is critical for a successful implementation of these standards. In earlier iterations of the EB model, Picus Odden and Associates modified its original $250-per-pupil recommendation for instructional materials in 2003 to a $160 recommendation in 2006. Because of the move to the common core, the current EB recommendation is to add an additional $30 to the $160 (2006) for a total of $190 per pupil. These additional funds would allow districts in some cases to purchase textbooks with rights to the electronic copies and would also permit the purchase of supplementary materials that support common core learning goals.

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 William (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 – a *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 student performance data are different from those provided by state accountability or summative testing, such as Arkansas' 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 at the end of the semester 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 during 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, to track student performance for the two-to-three curriculum concepts that would normally be taught during a nine week or so instructional period, and to progress monitor students with IEPs.

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, now one of three parts of Amplify which is an education division of News Corp launched in July 2012, has created a formative assessment, 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.

Many districts have also developed their own benchmark tests in mainly core subject areas. Others use common unit or chapter tests to gauge interim student progress toward achieving standards. While these tests cannot be normed because of their localized origin, they can provide valuable information to site and district teachers and administrators to ensure students are learning and that teachers have covered the subject standards required in district pacing guides.

Though some "interim" assessments are teacher created, 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. Analyses of the state tests provide a good beginning for schools to redesign their overall educational program. 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 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 student, 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, can be used to progress monitor students with IEPs, include both math and reading PreK-12, and cost less than this figure.

Resource Use Analysis

Our 2003 report recommended $250 per pupil for instructional materials. We refined our estimates for the 2006 report and suggested $160 per pupil for instructional materials and $25 per pupil for assessments for a total of $185 per pupil. The Legislature appropriated $160 per pupil for a prototypical schools – choosing not to fund the assessments, which were not called for in state standards. This figure has been inflated to $176.70 today.

The EB model has been recalibrated to $190 per pupil to ensure that adequate instructional materials can be purchased for common core implementation. The EB model also includes the $30 for short cycle, interim assessments, which are critical elements for schools improving student performance – even though they are not required by Arkansas standards. This would increase resources at a 500 student K-12 school from $88,350 to $110,000. However, in 2013, Arkansas districts spent only $50.5 million of foundation funding on instructional materials, below the $80.8 million provided by the funding program.

17. Extra Duty Funds/Student Activities

Elementary, middle and high schools typically provide an array of non-credit producing after-school programs, from clubs, bands, sports, and other activities. Teachers supervising or coaching in these activities usually receive small stipends for these extra duties.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
$0 per pupil grades K-5 $60 per pupil Grades 6-8 $120 per pupil grades 9-12	$55.20 per student	$200 per student for each K-8 student $250 per student for each 9-12 student.
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$27,600	K-8 $69,280 9-12 $38,300 Total $107,580

Analysis and Evidence

Research shows, particularly at the secondary level, that students engaged in student activities tend to perform better academically than students not so engaged (Feldman & Matjasko, 2005), although 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, 1996, 1997). Feldman and Matjasko (2005) found that participation in interscholastic (as compared to intramural) sports had a positive impact for both boys and girls on: grades; post secondary education aspirations; reducing drop out rates; lowering alcohol and substance abuse; and led to more years of schooling. The effect was particularly strong for boys participating in interscholastic football and basketball. One reason for these impacts is that participation in interscholastic athletics placed students in new social groups that that tended to have higher scholastic aspirations and those aspirations "rubbed off" on everyone. But the effects differed by race and gender, and are not as strong for African Americans.

In earlier adequacy work in a variety of states, the EB model included amounts in the range of $60/student for middle school students and $120/student for high school students. But subsequent research in additional states has found that these figures were far below what districts and schools actually spend. An amount for student activities equal to $200 per student for the prototypical elementary and middle school and $250 per student for the prototypical high school seems to be more adequate.

Resource Use Analysis

Under the current Arkansas matrix, funding of $55.20 per pupil provides $27,600 for personnel only in a prototypical school, while the current EB model funding levels would allocate $107,580 to a 500-student K-12 school, for both equipment and people involved in such activities. In addition to substantially higher per pupil funding levels in the EB model, the EB model also provides funding for elementary students, which is not included in the current Arkansas matrix.

CARRY FORWARD

In addition to school-based resources, education systems also need resources for district level expenditures including operations and maintenance, the central office and transportation. These are outlined below. When the EB studies were completed in 2003 and 2006, there was a limited resource base for many of these topics. As a result, estimated costs of adequacy for each category was carried forward and added to the total cost of the model/matrix. Today there is more research for many of these areas as identified below.

18. Operations and Maintenance

Computation of operations and maintenance costs is complicated by the lack of a strong or consistent research base. Many models, including Arkansas' model, allocate a percentage of current expenditures to operations and maintenance. Our EB model provides formulas to compute the number of personnel needed *at the school level* for custodial, maintenance and grounds work, but in many states including Arkansas, sufficient data to estimate the formulas by school are not available. The estimates provided here are based on the Arkansas 500-student K-12 prototypical school.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
$1,152 per student included in the carry forward estimate	Approximately 9% of foundation funding based on a series of studies and comparisons with National study	Separate formulas for custodians, maintenance workers and groundskeepers
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	Per pupil amount tied to percent of foundation funding. Includes property insurance funds 2013 $629.00	2.8 custodians, 1.0 maintenance workers 0.82 groundskeepers 4.62 total plus funds for materials and supplies of $116.73

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 needs 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.

This formula can be applied to a prototypical school of 500 K-12 students to estimate the number of custodians needed. The square footage of a prototypical school is estimated using elementary and middle school sizes of 67,950 square feet for 450 student schools, and 106,887 square feet for a 600-student high school. When these figures are applied to the 500-student Arkansas prototypical school the estimated size would be 75,798 square feet (average square foot per K-8 student plus average square foot per 9-12 student using the Arkansas number of students per grade). The computation is shown in the table below.

Category	Number	Custodian Estimate
Enrollment	500	1.5
Teachers	35.6	2.7
Classrooms	35.6	2.7
Gross Square Footage	75,798	4.2
Total Custodians (Average of four estimates)		2.8

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 continues to provide the school with adequate coverage for custodial services over time.

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 + (enrollment/1,000) x 1.3
+ General Fund Revenue/5,000,000) x 1.2] / 4
= Total number of Maintenance Workers needed.

We use the Arkansas prototypical school of 500 students in an eight school district and the same square footage estimates used for custodians to estimate the number of maintenance workers needed in a 4,000-student school district. We use the 2013 matrix foundation level of $6,267 to estimate General Fund Revenue. The table below shows the calculations for the number of maintenance workers.

This averages out to one maintenance worker per 500 student school.

Factor	Units	Weight	Number of Maintenance Workers
Buildings	8	1.1	8.8
Gross Square Footage	606,381/60,000=10.1	1.2	12.1
Enrollment	4,000/1,000=4	1.3	5.2
General Fund	(6,267*4,000)/5,000,000 =5.0	1.2	6.0
Total Maintenance Workers (Average of four values)			8.0
Number per school			1.0

Maintenance and Custodial supplies are estimated at $0.70 per gross square foot. The school gross square feet are 606,381 plus an estimated 10 percent more for the central office, bringing total district gross square footage to 667,019 and the cost of materials and supplies to $466,913 or $116.73 per student.

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. We have estimated that an elementary school needs 62 days per years of groundskeeper support, a middle school 140 days and a high school 388 days per year. Spread over a 500-student K-12 school this amounts to 180 days per year per school or 0.82 FTE

The table below summarizes Maintenance and Operations Personnel in a prototypical school of 500 students .

Category	FTE
Custodians	2.8
Maintenance	1.0
Groundskeepers	0.82
Total	4.62

It is necessary to add the per student 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.

Resource Use Analysis

Arkansas appropriates 9% of the foundation level for operations and maintenance. Direct comparisons with the EB model are not possible. At this point, we cannot determine what the per pupil cost for operations and maintenance should be. Further, the EB model should be applied to each building in a school district, and the costs will vary by number, age and condition of school buildings, and produce an operations and maintenance figure that varies across districts. We recommend that Arkansas consider moving to such a model for the operations and maintenance portion of the funding matrix, as we know such per pupil costs will likely vary across districts, sometimes substantially.

19. Central Office Staffing

In our earlier work in Arkansas, central office staffing was part of the carry forward. Today we have identified the components of a central office for a 3,900-student district with a total of eight schools (four elementary, two middle and two high schools). We estimate the per pupil costs of central office staff and apply that figure to each school district.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Included with Maintenance and Operations and transportation in an overall "carry forward" per pupil amount of $1,152	Included at a level of $415.10 with Maintenance and Operations and transportation in an overall "carry forward" per pupil amount now adjusted to $1,354	A per pupil amount calculated from a 3,900-student prototypical school district.
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	Districts currently spend an estimated average of $234.35 per pupil	Has ranged from $488 to $644 per pupil in recent studies in other states

Analysis and Evidence

We have identified resources for central office in other reports. The most recent states in which we have comparable data are Texas, North Dakota, Kentucky and Maine. Our approach has remained relatively stable, estimating the number of central office staff required to lead and manage a prototypical district of 3,900 students. Shifting to Arkansas' 500-student prototype school, one would create a 4,000-student prototypical district consisting of eight schools. This is very nearly the same size as our current model and the resources should be essentially the same.

The table below shows the staff included in our central office model. There are a total of 10 professional positions and 8 support positions (computer technicians are counted as support).

Central Office Staffing: Prototypical District of 3,900 to 4,000 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 Assessment and Evaluation	1
Secretary	3
Technology	
Director of Technology	1
Computer Technician	1
Secretary	1
Operations and Maintenance	
Director of Maintenance and Operations	1
Secretary	1
Other Expenses	
Miscellaneous (purchased services, supplies, legal, audit, association fees, elections, technology, etc.)	
Communications	

Over the past several years, we have developed these central office staffing recommendations in a number of states including, Washington, Wisconsin, Texas, Kentucky, Maine and North Dakota. 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. In three states, (Washington, Wisconsin and North Dakota) we conducted professional judgment panels to review the basic recommendations that emerged from Swift's research to enhance our estimates of 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 nine central office professionals (9.1) in a district of 4,000 students. Our research based staffing formula of 10 FTE professional staff exceeds the ERS estimate by one position. This is largely a function of greater staffing requirements for assessment and evaluation in recent years.

In other states when we estimate central office staffing for a district half the size of our prototypical district the staffing is also reduced by half suggesting there is no material difference in the cost per pupil for central administration in smaller districts. In fact we have found this to be the case until district size is reduced to about 390 students, which is smaller than the Arkansas prototype. Since adjustments for small size are not included in the matrix, no adjustments would need to be made for the central office component of the matrix.

Resource Use Analysis

Arkansas currently funds central office operations at $414.10 per student, which is lower than our recent estimates in other states as shown in the table below.

State	Year	Per Pupil Resources for Central Office
Texas	2012	$549
Maine	2013	$448
Kentucky	2014	$633
North Dakota	2014	$644

20. Transportation

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Included in an overall "carry forward" per pupil amount of $1,152	Included at a level of $309.90 in an overall "carry forward" per pupil amount now adjusted to $1,354	The EB does not address transportation, but recommends providing aid on a categorical basis based on multiple factors
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$309 per pupil	Not addressed, but recommends providing aid on a categorical basis based on multiple factors

The EB model does not address pupil transportation, but because transportation costs vary across school districts we have recommended that states adopt a transportation formula that recognizes such varying costs. Current Arkansas policy provides 309.90 per pupil to all districts for transportation through the matrix. The BLR has conducted a study to estimate the costs of transportation by school district on the basis of miles driven, number of school bus riders and the ADM of the district. Using this model redistributes resources among school districts but does a much better job of reimbursing school districts for actual transportation costs. In our 2006 report we recommended using a model of this sort to more accurately distribute transportation funds to districts on the basis of need, rather than simply providing a flat grant per pupil. We continue to make that recommendation and it appears the model developed by BLR would accomplish that goal. We would recommend the funds be distributed through a categorical program.

STAFFING FOR STRUGGLING STUDENTS

The core staffing section of this document contains positions for supporting teachers and students beyond the regular classroom core teacher. Those positions include elective or specialist teachers, tutors and pupil support personnel. However in many instances, *additional* support for struggling students are needed. The programs described in this section 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 described at the beginning of this chapter.

It is important to note that we use two specific counts of pupils.

1. For programs that use an "at risk" count the number of pupils includes all NSL students in a school as well as all ELL students who are not NSL eligible. The result is an "unduplicated" count of all NSL and ELL students. We have made this change to the count of at-risk students to ensure that all ELL students, regardless of NSL status, are eligible for the extra help strategies that most if not all ELL students need as they work to learn both content and a new language – English.
2. For the ELL program, we use the count of all ELL students regardless of NSL status.

The EB model provides substantial additional resources for students based on at-risk student (unduplicated NSL plus ELL) counts – tutoring, extended day, summer school, and pupil support. These resources for students struggling to achieve to academic standards should be viewed in concert with resources for students with real disabilities. 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 (unduplicated NSL plus 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.

This section includes discussion of five categories of services: tutoring and pupil support, extended day, summer school, programs for ELL students, and programs that provide Alternative Learning Environments.

21. Tutors and Pupil Support

The first strategy to help struggling students is to provide additional supports for struggling students as described in Elements 5 and 8 above. In addition to the one tutor position provided to every prototypical school of 500 K-12 students, and the 2.3 pupil support personnel (guidance counselors) provided to each prototypical school, we provide an additional tutor position and an additional pupil support position for every 125 at-risk students (unduplicated NSL plus ELL).

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 tutor position and one pupil support position for every 100 NSL students	1 position ($517 per NSL student) for districts with an NSL percentage up to 70% 2 positions ($1,033 per NSL student) for districts with NSL percentage between 70 and 90% 3 positions ($1,549 per NSL student) for districts with NSL percentage above 90%	1 tutor position and one pupil support position for every 125 at risk (unduplicated NSL + ELL) students. These positions are provided additional days for professional development (Element 14) and substitute days (Element 7) discussed above.
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	Funding for extra help strategies is based on the percentage of NSL students in a district	Assuming an average of 50% of a 500-student K-12 school are unduplicated NSL plus ELL students, the school would generate 2.0 additional tutor positions and 2.0 additional pupil support positions

Analysis and Evidence

Tutoring: 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 (Cohen, Kulik & Kulik, 1982. Shanahan, 1998; Shanahan & Barr, 1995; Wasik & Slavin,1993) 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-student 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. This is part of the rationale for including 1 tutor in each prototypical school, regardless of the number of at-risk students.

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 20^{th} or 25^{th} percentile on a norm referenced test, or at the below basic level on state achievement tests. Intensive instruction for groups of three-to-five students would then be provided for students above those levels 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. However, the new randomized control study discussed above in Element 5 on the core tutoring/tier 2 intervention allocation for all schools (Cook et al., 2014) found similarly positive impacts of a tutoring program for adolescents in high poverty schools IF it was combined with counseling as well. This is made possible in the EB model as it includes such additional non-academic pupil support resources (see Element 8 discussion).

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, in the past, the EB model provided one fully licensed teacher-tutor position for every 500-student school, and in addition, one position for every 125 at-risk students (i.e., the unduplicated count of NSL and ELL students). For the Arkansas 500-student school, this standard would provide at least one position and up to four more positions if the school were all at-risk students.

Pupil-support: At-risk students also tend to have more non-academic issues for schools to address. This usually requires interactions with families and parents. The EB model addresses this by providing more staffing resources to meet these needs. 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 programs that have an impact on 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, such as the new college and career ready standards, programs that help parents and students understand both what needs to be learned and what constitutes acceptable standards for academic performance have been found to improve student outcomes. 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 students academic learning (Steinberg, 1997).

At the secondary level, the goal of parent outreach programs is to have parents learn about what they should expect of their children in terms of academic performance. If a district or a state requires a minimum number of courses for graduation, such as Arkansas' 22.5 course credits, 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 parents understand how to more effectively assist their children find an academic pathway through middle and high school, understand standards for acceptable performance, and 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 range, 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 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 resources in the EB model 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 includes a family outreach coordinator, a nurse, social worker, guidance counselor and education diagnostician. This group functions as a parent outreach team for the school,

serves as case managers for students who need non-academic and social services, and usually includes a clothing strategy to ensure that all students, especially in cold climates, have sufficient and adequate clothes, and coats, to attend school.

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

Resource Use Analysis

The Arkansas funding matrix recognizes the importance of providing additional resources for struggling students, and does so through a categorical program that provides funding based on the percentage of students who qualify for free and reduced price lunch – the National School Lunch (NSL) program. The Arkansas model provides $517 for every NSL student in districts where 70% or less of the students qualify for NSL. In districts where the NSL percentage is between 70% and 90%, districts receive funding of $1,033 for each NSL student and when the NSL percentage is above 90% funding is $1,549 per NSL student.

In contrast, the EB model provides resources for tutors and pupil support for every prototypical school and then additional resources in terms of one additional FTE tutor and one additional FTE pupil support staff member for every 125 at-risk students. Since the Arkansas funding is on a per pupil basis and the EB model funds positions, a direct comparison is not possible.

22. Extended-day programs

At both elementary and secondary school levels, some struggling students are likely to benefit from after-school or extended-day programs, even if receiving Tutoring/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.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Nothing recommended in 2003 adequacy study. 2006 Recalibration study recommended (1) teacher position for every 30 NSL students (or 3.33 FTE per 100 such students). Position paid at the rate of 25 percent of 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 NSL students.	No specific formula but the funds from the NSL categorical grant could be used for extended day programming.	One (1) teacher position for every 30 at-risk students (unduplicated NSL plus ELL), or 3.33 FTE per 100 at-risk students. Position paid at the rate of 25 percent of 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 at-risk (unduplicated NSL plus ELL) students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	No specific formula but the funds from the NSL grant could be used for extended day programming.	Assuming an average of 50% of a 500-student K-12 school are unduplicated NSL plus ELL students, the school would generate 2.1 additional staff positions

Analysis and Evidence

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 (e.g., Takoata & Vandell, 2013: Vandell, 2014). 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
- Consistent participation in a structured program
- 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 recommended in the EB model could 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 at-risk students will need or will attend an after school program, the EB model assumes 50 percent of the eligible at-risk students 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 at-risk students (i.e.., unduplicated NSL and ELL student counts) 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 Arkansas 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 provided will vary across Arkansas' school 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 other states that improved student performance had various combinations of before and after school extra help programs.

Resource Use Analysis

The Arkansas funding system is silent on resources for extended day. Thus any resources generated on the basis of at-risk pupil count would provide personnel (or the funding for such personnel) beyond what is currently in the matrix.

23. Summer School

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).

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
Nothing recommended in 2003 adequacy study. 2006 Recalibration study recommended (1) teacher position for every 30 NSL students (or 3.33 FTE per 100 such students). Position paid at the rate of 25 percent of annual salary—enough to pay a teacher for a six to eight week 4 hour per day summer school program and include adequate time for planning and grading This formula equates to 1 teacher position for every 120 NSL students.	No specific formula but the funds from the NSL grant could be used for extended day programming.	One (1) teacher position for every 30 at-risk students (unduplicated NSL plus ELL), or 3.33 FTE per 100 at-risk students. Position paid at the rate of 25 percent of 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 at-risk (unduplicated NSL plus ELL) students
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	No specific formula but the funds from the NSL grant could be used for extended day programming.	Assuming an average of 50% of a 500-student K-12 school are unduplicated NSL plus ELL students, the school would generate 2.1 additional staff positions

Analysis and Evidence

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. More recent *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). Indeed, 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 (see also McCombs, et al., 2011) 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, and
- 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 at-risk (unduplicated count of NSL and ELL) 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 eligible at-risk students 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 at-risk 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 at-risk (unduplicated free and reduced price lunch and ELL) student.

Resource Use Analysis

The Arkansas funding system is silent on resources for summer school. Thus any resources generated on the basis of at-risk pupil count would provide personnel (or the funding for such personnel) beyond what is currently in the matrix.

24. English Language Learner (ELL) Students

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.

ELL is a separate program from the at-risk programs described above in the sections on tutors, extra pupil support, extended day and summer school. Funding is provided for *all* ELL students for these additional services regardless of NSL status.

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
0.4 FTE per 100 ELL students	$305 per ELL, or about 0.6 FTE per 100 ELL	One (1) FTE teacher position for every 100 identified ELL students.
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$305 per ELL, or about 0.6 FTE per 100 ELL	One (1) FTE teacher position for every 100 identified ELL students.

Analysis and Evidence

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. Nevertheless, 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,* Gerstein (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 in the four at-risk student (unduplicated NSL and ELL) triggered programs: tutoring, extended day, summer school and additional pupil support.

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 report
- Adequate instructional materials (Element 16) and good school conditions
- Good assessments of ELL students so teachers know in detail their English language reading and other academic skills (Element 16)
- 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 14)

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 ESL 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. The EB model addresses this need by making sure that the ESL resources triggered by just ELL pupil counts are *in addition* to other Tier 2 intervention resources including tutoring, additional pupil support, extended day and summer school resources (Elements 21-13), as well as the pupil support staff (Element 8).

For example, a school with 125 NSL students and no ELL students would receive approximately 1.0 tutor position, 1.0 extended day, 1.0 summer school and 1.0 additional pupil support resources. But if the 125 low-income children were all ELL students, the school would receive an *additional* 1.25 teacher positions primarily to provide ESL instruction.

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 at-risk (unduplicated NSL and ELL) backgrounds and ESL specific resources (Jimenez-Castellanos & Topper, 2012). That is why the EB model today has augmented its at risk student count – which was students eligible for free and reduced price lunch – to include the "unduplicated" count of students who are either free and reduced price lunch (NSL) or ELL. This could be done by dividing the ELL student count into two groups: those ELL eligible for the NSL program and those ELL not eligible for free and

reduced price lunch. And the at-risk student count would then be the total number of free and reduced price lunch students plus the ELL students who are not eligible for free and reduced price lunch. This would ensure that all ELL students would trigger the extra resources for the Tier 2 interventions as well as the resources for ESL instruction.

Resource Use Analysis

Arkansas provides ELL funding through a categorical program that funded school districts at a rate of $305 per ELL pupil for FY 2013. A total of 151 districts received funding that year and spent an average of $428 per ELL student on programs to meet their needs. In addition to the at-risk resources discussed above, the EB model would also provide support for ELL teaching positions at a rate of one ESL teacher per 100 ELL students, which would provide $60,566 for a school with 100 ELL students or $605.66 per ELL student.

25. Alternative Schools

Original EB Recommendation	Current Arkansas Policy	Current EB Recommendation
1 teacher for every 20 ALE students	$4,228 per ALE student, which equals 1 teacher for every 14 students	1 assistant principal position plus 1 teacher position for every 7 FTE students in an alternative school program, as well as the dollar per student resources (instructional materials, technology, etc.) and Central Office and Maintenance and Operations.
	500-student Prototype Resources – Current Arkansas Policy	**500-student Prototype Resources – Current EB Model**
	$4,228 per ALE student, which equals 1 teacher for every 14 students	1 AP-level position funded plus 3 teachers for an ALE school with 21 students, plus the dollar per student resources (instructional materials, technology, etc.) and Central Office and Maintenance and Operations.

Analysis and Evidence

A small number of students have difficulty learning in the traditional school environment. The ALE students this report addresses are those that also have some combination of significant behavioral, social and emotional issues, often also including alcohol or drug addictions. Such students often do much better in *small* "alternative learning environments." However, we note that this rationale for ALE 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, which we believe is also the state's concept, 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.

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 are able to identify is from the Urban Institute (Aron, 2006), which defines 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 one 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

Resource Use Analysis

ALE programs are funded through a categorical program that provided $4,228 per FTE ALE student in 2012-13. Districts spent a total of $39.9 million for ALE programs that year, substantially more than the $23.0 million those students generated. And the EB model would provide more ALE resources.

CHAPTER 3: DEVELOPING AN UNDERSTANDING OF THE POTENTIAL COSTS OF BROADBAND

INTRODUCTION

When the Arkansas funding matrix was developed in 2003 and evaluated in 2006, schools were only beginning to use technology and on-line resources to provide education programs for their students. Today, access to the Internet and to the materials and resources available on-line is a growing need for all schools. The state has established minimum standards for broadband access for all schools and is currently wrestling with how those services can be provided throughout the state.

Arkansas has recognized the need to provide broadband access for their school districts, their constituent schools, and public charter schools. This broadband commitment has clearly been demonstrated over the last few years through the efforts of educators, legislators, as well as top state government and private leaders. The question has turned from "if" broadband is needed in the Arkansas schools to "how much is needed," "what model do we use to implement it," and "how do we pay for it."

This Chapter addresses several issues related to how Arkansas can move forward to equip its schools with sufficient broadband access needed for instruction and testing. The chapter has three sections. The first discusses the need for broadband services in schools and districts, identifying the major studies that have been conducted and the services currently and potentially available for providing broadband. The second section of this chapter identifies the specific areas the Legislature and state leaders need to consider as they move forward in developing a statewide broadband network for schools. The third section addresses areas to consider as the state moves forward to provide broadband for all: the expertise to mange the process, the capital intensive nature of broadband, and issues related to management and maintenance once broadband systems are provided. Finally the fourth section of this chapter provides thoughts about how to develop estimates of the costs of providing broadband in Arkansas' schools.

NEED FOR BROADBAND

As electronic resources, both static and interactive, increasingly continue to become available through public and private networks, the need to have a connection that can download and upload data and content without latency grows in importance to individuals and institutions. In K-12 education, there are myriad electronic resources available that allow students to experience learning in an interactive environment with limitless choices. With the proper connection, students can video conference with experts in marine biology and space exploration, watch great teachers demonstrate the principles of geometry and math in the Khan Academy, participate in scientific experiments such as virtual dissections, collaborate in group projects, discuss the latest issues in asynchronous and synchronous discussion blogs and boards, take advantage of blended learning opportunities, evaluate and analyze practical information from diverse sources, and most recently take online assessments to show their achievement on common core and state standards.

School districts, backed by state government, need to provide sufficient access to networks so that students can actively utilize all of these resources without latency; latency interrupts and distracts students from the learning process. Schools housing high concentrations of bandwidth-hungry students must provide adequate levels of bandwidth so that learning can come alive. Broadband, which provides high-speed connections, allows technology to become transparent and students to focus on concepts and content.

Act 1280 of 2013

The Arkansas Legislature set the stage for the need for broadband by passing Act 1280 of 2013, the Digital Learning Act. The Digital Learning Act called for the expansion of digital learning courses and the removal of "impediments" to the digital learning process. Act 1280 directed each school to provide every student with the opportunity to take at least one digital learning course as either a primary or a supplementary method of instruction and required that all students -- starting with 9th graders in 2014-15 – take at least one digital learning course.

The Digital Learning Act did not define the criteria for these courses, nor whether these courses should be taken during the school day or in the evening at home. However, if the state does not want to be responsible for providing access to students in their homes to fulfill this mandate, it must assume that these courses can be taken during the day, at school, with other students, all of whom will be competing for the computer resources and bandwidth necessary to actively participate in learning.

It should also be assumed that legislators would hope that the available digital course work would have interactive modules, instructional videos, and opportunities for online discussions. All of these learning activities require higher bandwidth levels than what was used in earlier generations of digital course work in which "digital course work" meant nothing more than "scanned worksheets."

The "impediments" which the Act mandates for removal are undefined. Possible impediments or challenges to overcome include the restructuring of the typical school day to include complete digital learning courses, ensuring students have access to computers or other devices (addressed in earlier chapters of this analysis), the creation of truly interactive learning coursework, finding teachers who have received professional development in teaching methodologies and strategies that work in an "online" environment, and, of course, the provisioning of adequate bandwidth so that coursework can be successfully utilized by students.

Arkansas Digital Learning Study

As a result of Act 1280, the Arkansas Department of Education (ADE) was asked to initiate a study, led by a committee of educators, telecommunications providers, legislators, and other stakeholders, to help set the parameters of providing adequate bandwidth to support digital learning. The resulting *Arkansas Digital Learning Study* (State of Arkansas, 2014), outlined what the committee called ***A New Vision for K-12 Networking*** which held six principal recommendations:

1) Connect school districts with a robust fiber-optic network
2) Adopt high bandwidth standards established by the State Educational Technology Directors Association (SETDA)
3) Centralize management for statewide network support services
4) Efficiently aggregate statewide demand
5) Optimize the use of E-Rate and other Federal programs
6) Provide value-added services such as professional development and technology support training over the more robust network.

These six recommendations provide criteria and strategies that provide Arkansas legislators and educators with vital pieces to the solution of providing a bandwidth-rich environment for their students.

In Recommendation #2, the study committee adopts the high bandwidth standard presented by the State Educational Technology Directors Association (SETDA). SETDA suggests that in 2014-15 schools should be providing 100 megabits per second (Mbps) for every 1,000 students and that this bandwidth should be increased to a target of 1 gigabit per second (Gbps) for every 1,000 student/staff member by 2017-18 (Fox, et al 2012).

The 2014-15 target would provide a level of service that would adequately meet the needs of all students and staff with the current digital resources that are available and throughout the majority of the school day would provide excess bandwidth. It is important to note, however, that although there would be excess capacity in the system at most times during the day, the targeted threshold bandwidth would be able to handle the spikes in data that occur during intense use of data-heavy educational resources and/or other interactive applications such as online testing. The 2017-18 target from SEDTA is very forward-looking and assumes new applications that would require more bandwidth and more frequent student use. To reach either of these targets, the committee presenting the report makes Recommendation #1, to connect all school districts with fiber optic cabling.

The committee writing the Digital Learning Study (DLS) stressed the need for adequate bandwidth. One of the subcommittees of DLS suggested that many districts have fiber available to them but that these districts are not taking advantage of the fiber because of the cost of initial installation, new network routing equipment, and the ongoing cost of the bandwidth. This needs to be studied further.

In October 2013, the ADE reported that there was an average 71 Kbps of bandwidth per student of bandwidth (71 Mbps per every 1,000 students) from 254 reporting districts and public charter schools; however, only 51 of those respondents reported having bandwidth that equaled or exceeded the SETDA standard (ADE, 2013). It was not clear from the report whether the districts reporting bandwidth lower than the SETDA standard had access to fiber and did not want to pay for additional bandwidth, or if fiber was not available to these districts.
The other recommendations listed in the DLS were strategies that would reduce the cost of bringing higher bandwidth levels to schools. All of these recommendations are industry standard

practices that could help Arkansas schools implement higher bandwidth at better price points, but all require additional resources and/or coordination at the state or ADE level.

Fast Access for Students, Teachers, and Economic Results (FASTER Arkansas) Task Force

Concurrently with DLS, the FASTER Arkansas Task Force was formed to advocate for higher bandwidth in the schools. Committee members consisted primarily of business leaders from private and public organizations.

FASTER Arkansas is self-defined as "an organization dedicated to ensuring all of our students [in Arkansas] receive the high-speed Internet access they need for a 21st century education." Organization members posit that increasing high-speed access will reduce the current cost of Internet access for schools and taxpayers and will attract high-paying technology employers to the state.

FASTER recommends that Arkansas change the law to allow school districts to connect to the ARE-ON research network to provide fiber connectivity to locations where fiber may not be available from traditional telecom companies. It also recommends that more "middle mile" fiber be made available to reduce overall costs to districts that want to take advantage of this already-funded-by-taxpayers network. FASTER cites that 41 of the 42 research networks that exist in states allow this access, Arkansas being the one exception (FASTER, 2014).

The DLS also recommended that ARE-ON be open to districts and pubic charter schools. In the study there is a detailed discussion outlining the history of the legislation that prohibits Arkansas schools from connecting to the ARE-ON network or creating their own statewide provider networks.

Governor's Announced Partnership with Non-Profit Consultant Group

The Governor recently announced a partnership with the technology-advocacy non-profit group named EducationSuperHighway (ESH). ESH has outlined a loose set of steps that would bring Arkansas to reaching bandwidth goals. Although the steps outlined by the group provide a possible roadmap, there are very few details available on how this group would participate in this plan and how the relationship between the state and this organization would be defined. Before work could begin on any of the steps outlined by ESH, more details and cost information are needed. ESH has announced that Arkansas is one of two states that have been selected to receive their assistance without consulting costs.

One of the first steps that ESH outlines is surveying district bandwidth. However, the Bureau of Legislative Research (BLR) has already released a request for proposal (RFP) to support work to create a detailed district inventory and to assess the cost to connect districts to high bandwidth networks. There is no need to duplicate the BLR effort.

Bureau of Legislative Research Request for Proposal for Network Technology Consulting

On August 20, 2014 the Bureau of Legislative Research released a Request for Proposal for Network Technology Consulting. The workscope laid out in the RFP is specific and will bring detailed results when executed properly. The RFP focuses on: determining the costs of installing increased bandwidth to the districts from available providers; approximating the costs of new equipment to support increased bandwidth; and estimating the cost of connecting to the Arkansas Research and Education Optical Network ("ARE-ON"). By including ARE-ON in this assessment, the BLR will be able to estimate the cost implications of ARE-ON participating as a major piece of the school networking puzzle.

One of the initial costs of bringing fiber to a district is the consulting expense to order, install, and configure the new equipment at the point of entry, or d-mark. The RFP does not request the estimation of costs for these high level consultants but instead approaches the issue by inventorying the skill set and certifications of technology-related district employees and consultants. This will allow those who disaggregate the data at BLR to determine if districts and schools are able to direct their own projects or if it will be necessary to support the process through alternate means such as outside consultants or state-hired personnel.

The results of this study will be invaluable in assisting Arkansas' legislators to determine their next steps in the broadband expansion process. If it is determined that, in fact, districts have broadband available to them locally but have chosen not to access it because of installation and ongoing costs, or lack of expertise, then a solution of providing "last mile" grants may be an effective approach.

If, however, it is found that there are many districts that simply do not have fiber available in the near or adjacent areas, then a process of creating "middle mile" network legs or changing the law and expanding the ARE-ON network may be considered.

The ARE-ON network is an excellent resource and should be considered in any solution. The BLR Request for Proposal results will determine how key a role ARE-ON could play in provisioning K-12 broadband.

It should be noted here that even before the results of the BLR are brought forward, there will be a great disparity in need among individual K-12 school districts and charter public schools. Some districts and public charter schools that are situated closer to fiber networks or that have partnered with outside organizations have already absorbed the costs of implementing a high-speed network. Other districts and public charter schools that may have distance barriers or have avoided the one-time and ongoing costs for increasing network needs may have a substantial financial need. This disparity may cause friction between those districts that have already invested in broadband and those that have not done so if the state chooses to appropriate funds to bring all districts up to the broadband standard.

The Arkansas funding matrix provides most of the money schools receive on a per-pupil basis. This dynamic works because the highest expense in school districts is based on personnel costs that can be distributed through ratios. Providing broadband however, is a capital-intensive effort

that will not vary by the number of students in a district but instead by distance from fiber, the terrain type that needs to be crossed, the age and ability of current network equipment, and in some cases, service provider cost structures.

A district that is two miles away from available fiber cabling will have fewer needs than a district that is twenty miles away from fiber even if both have the same number of students. There may be two districts with similar student counts that are an equal distance from fiber but one is located in an urban area that has already-established pathways for telecommunications whereas the second district is in a rural area that would require trenching, new conduit, and extensive right-of-way requirements. Some districts may have more modern wide-area network equipment that can accommodate higher bandwidth by adding a module in a core switch and changing out the district's principal router. Other districts may require a complete refresh of their core switching and router equipment.

This means that based on the disparities mentioned above, solutions that will be proposed to achieve the goal of providing broadband access to all students will need to be developed on a district-by-district basis. What the BLR study will provide is an initial estimate of the potential costs of expanding broadband. If districts that have already been connected to higher bandwidth – particularly if the connection was funded through district funds – see funds being diverted from other areas, there may be resistance to the state's efforts.

One reason some states have funded rounds of high bandwidth projects is to distribute costs over a longer period of time. In Arkansas, depending on the results of the BLR study, the state may decide that first round funds might be better distributed to ARE-ON to extend "middle mile" networks to outlying areas. Then, additional rounds of funding could be distributed to school districts to address providing fiber connections over the "last mile" to complete the high-speed network.

Areas to Consider in the Future

There are some areas of consideration that Arkansas must address after the scope of the broadband deficit is quantified and qualified by the BLR study.

Expertise

The first area to consider is who does Arkansas have to lead this effort? For Arkansas to meet their broadband goals, the state must leverage current *expertise* from within Arkansas state organizations and/or hire outside consultants who have specific telecom knowledge in building these networks. There are three areas of expertise that are necessary: 1) knowledge of networks and networking equipment, how devices connect to each other and the proper protocols that are necessary to provide secure and reliable data transport; 2) knowledge of how fiber is laid, of how to identify feasible fiber network pathways, and how to install those fiber lines; 3) knowledge of the regulatory process, how local and county government operate, and most importantly how best to quickly secure the right-of-ways necessary to install additional fiber in already established pathways or to create new pathways to bring fiber to an area previously under- or un-served.

Finding one individual with extensive knowledge in all of these three areas is difficult. This is why many states have formed public/private partnerships that bring together individuals from both state organizations and the telecom industry who collectively have this expertise. Current talent within state organizations can be leveraged through part-time membership on the board or advisory council of a new or modified organization. The same can be true from telecom partners. North Carolina created such a non-profit public/private partnership that has for-profit arm (Clark, 2010). Public/private partnerships have flexibility of structure and can avoid some of the bureaucratic red tape that is necessarily a part of all public structures. Forming public/private partnerships to increase statewide bandwidth is common among many states (E-NC Authority, 2006, 36-38; State of Arkansas, n.d.).

Alternately, depending of the scope of the BLR findings, the broadband issue might be addressed within a current state organization by hiring various personnel with telecom industry expertise and/or governmental expertise to streamline governmental processes to acquire right-of-ways. While an in-house-state-structure could work, it is difficult within a large organization to not be distracted with other goal areas set by the organization. One of Arkansas's more nimble organizations that has specific expertise in high-speed networks is ARE-ON. In examining membership, staff, and board of ARE-ON, there is deep expertise in organizing and managing a network infrastructure, however the breadth of the organization would need to be expanded so that it could better understand specific issues related to the K-12 school system.
If an organizational structure is created outside of the traditional state departmental setting, it should be focused on one goal, connecting schools to broadband in the most efficient means possible.

Capital Intensive

Building broadband to schools is *capital intensive*. Telecom companies traditionally focus on urban areas because of their customer density. A higher customer density allows the company to pay off their initial installation investment more quickly by generating more customers than are available in a rural area. Rural areas also require a higher initial investment per user because of the additional cable spans needed to bridge the distance across a sparse customer base (Sewall, 2014, sec 4-6). This means that there are many fiber or cable runs that are unattractive to a telecom company in the business sense. If the business case cannot be made to connect an area then telecom companies will not be willing to invest the funds despite the fact that the company may recognize the need to serve under- and un-served customers. Telecom companies will first search for those opportunities the will pay off the fastest for their companies and shareholders.

In situations where it becomes clear that a business case does not exist to motivate telecom companies to bring new capacity to sparsely populated areas, it may be necessary for the state to subsidize these runs. This can be very expensive depending on the distinct circumstances that exist in each individual case. There are specific costs that vary such as distance, the existence or non-existence of already established pathways and/or right-of-ways, features of the terrain, availability of facilities at the source, intermediate, and final destinations of the new fiber runs, and the costs, charges, and rights necessary to connect into a network proprietary to and owned by what may be another telecom company or the state run network. These variables require that

each run or destination be studied to understand the various alternate scenarios that are present to develop a run and connect it in the most efficient and/or cost effective way possible. These situations make clear the need for the expertise referenced in the preceding paragraphs.

Counterintuitive at first analysis, strategies that might be the most cost-effective in the short-term may not be the most cost-effective in the long-term (the ability to provide ongoing service at the cheapest possible rate). If a company is responding to an RFP to run fiber to Destination X and has its own fiber 15 miles away or alternately could connect to Destination X through another provider's network node only 10 miles away, it may be more cost effective for the company to bring fiber from their own network 15 miles away than it would be to pay charges to transport data over the other carriers' networks. Market forces will usually determine what is the most cost-effective approach. These market forces come into play in areas that have sufficient density to produce profits relatively quickly as the initial investment of capital is paid off. However, in areas that provide no clear prospect for profits over the long term, companies are less likely to try to find creative ways in which to reach a remote or less densely populated area.

In cases in which the profit potential is limited at best, the state may have to make the initial investment to lay the fiber and then work out a model in which the state or its agencies or the citizens of the area served can benefit in the long term financially or otherwise from the investment (Windhausen, 2008, 36-44).

There are various strategies that the state can use to make these installations more attractive. These strategies, however, generally cannot be used by individual school districts because they fall outside of their jurisdiction and these districts typically do not have the necessary expertise to understand telecom and right-of-way requirements.

One of the strategies for lowering costs is the bundling of projects or service. Bundling or consolidating service was one of the recommendations of the Digital Learning Study. With various projects available to it, the state could bundle into one RFP a combination of less and more profitable routes, or propose consolidating current routes, forcing the vendor to take on less beneficial routes to win the more beneficial business. In the case of bundling, those individuals stitching together RFPs would need to understand where all potential fiber lay so they could package a specific RFP in such a way that they would drive competition.

As mentioned above this would take a different expertise than school district administrators typically have. If individual school districts tried to take this on, they would first have to negotiate among themselves to create a joint RFP. If this were a bundling of new routes those districts with more favorable routes would not want their pricing to be affected negatively by a district with less favorable routing unless the state were to pay the expenses or their overall cost. For bundling to be effective it is necessary to organize bundled RFPs at a higher level than the individual district and it is essential to have someone doing this who has a deep knowledge of the telecom industry and profit structures that make routes financially feasible.

The practice of bundling can be accomplished at either the county or state level, however the more flexibility in the number of locations and routes that those bundling the RFP have, the more effective that bundling can be. If the group that is creating the RFP is a public organization like

the Arkansas Department of Education, individual telecom vendors could protest the process of bundling claiming a type of gerrymandering that might benefit a specific telecom company. Moving this process into a public/private partnership might not remove those protests but would at least mitigate the possibility this would happen.

Another strategy that can be effective in lowering the cost of having a telecom company lay fiber in areas that are less cost effective for investment is to negotiate the future use of the new line with the company that lays the fiber. This strategy requires a discussion of ownership. For runs in which there is very limited potential for profit, thus extending the timeframe for recovering invested capital far into the future, it may be necessary for the state to take on the majority, or all of, the initial investment in the laying of fiber. If the state pays for the cost of laying the initial lines, the state should take ownership, full or partial, of that line to protect its investment and ensure that the state will benefit from the investment. One means of making partial ownership more attractive for a vendor would be to allow the vendor to serve and sell service to other customers along the newly installed line.

In consideration of state-supported fiber runs and ownership, states do not typically have the capacity or expertise to become a middle network telecom company. Contracts that are beneficial to both public and private parties can be convoluted and take long periods to negotiate (Sewall, 2014, sec 4-49). The ultimate goal of this process might be to eventually sell the network back to the private company or to eventually turn it over to that company with agreements that the needs of the public agency will continue to be met.

Most public agencies are under strict guidelines regarding procurement and bidding processes. It is for this reason, that creating a public/private partnership can be more advantageous to the state than trying to build an organization within an already existing governmental structure to meet their broadband goals.

Network Management and Maintenance

The third element to creating broadband infrastructure is *management and maintenance of the network*. To most technology administrators in school districts and state-run departments, "managing the network" means configuring the devices on both ends of the fiber or copper lines, it does not mean maintaining or repairing the physical lines they lease that arrive at the school district, or that carry the signals from the district office to district schools. Neither schools nor the state want to be responsible for these physical lines. This is a telecom responsibility and these companies have the knowledge and equipment necessary to properly maintain the physical aspect of the network and the transport of data to and from the major locations in the districts. A public/private partnership would also want to avoid the responsibility of repairing the physical lines and would therefore need to ensure that contracts with an installing company require physical line maintenance (CENIC, 2003).

Cost of Broadband

There are two specific costs associated with making broadband access available to all Arkansas students. The first consists of one-time capital expenditures to connect districts, schools, and

charter schools to an available high-speed network either public or private. The second is composed of the ongoing cost of broadband service to districts and schools.

The BLR has requested a per-student cost in both of these areas. However, there are large, unavoidable variations in each of these calculations that make a per-student funding calculation impractical. In fact, each of these areas must be examined on a district-by-district, and in many cases, a school-by-school basis to ascertain site-specific costs.

Site-specific capital costs can be combined instead of averaged to calculate the investment that would be needed to provide broadband connections to all schools. Once connections are "equalized" through the capital investment process, ongoing costs could be used to better understand areas of possible savings through consolidation, price negotiation, and/or reduced ongoing pricing resulting from new fiber broadband connections.

The Request for Proposals that the BLR has released will provide a basis for overall cost estimates to be accurately made for both the initial statewide and site-specific capital costs and the ongoing costs of providing broadband to these entities. It will be important for the BLR to ensure that the selected consultant obtain individual school site and district potential costs and savings in both of these areas. One metric the consultant should verify is the price per megabit being paid. By doing this, sites with the largest potential savings can be quickly identified.

Capital Costs for Initial Broadband Connections

As discussed above, the capital expenditures needed to connect each district or school to broadband are site specific. Costs will vary based on the distance the site is from available broadband, the difficulty of the terrain between the district or school and the connection, and the equipment that district and the service provider have or will need to acquire to make the connection.

In connecting schools to broadband each specific instance is unique. Regarding calculating a per-student expenditure, it would be possible as each case is researched to divide the capital costs by the number of students at that school site to generate a per-student cost for that particular connection. However, when the same methodology is applied at other sites, the per-student cost would vary widely among different schools and districts making an average cost per-student impractical as a potential distribution mechanism for funding. If districts were funded on a per-student basis regardless of their particular connection need, districts and schools that were already connected could use these funds for projects other than the targeted purpose.

It would be much more useful to understand the statewide costs to make all initial capital investments required to connect all schools to broadband and then determine if the state is willing to fund these connections, or a portion of these connections, in a onetime allocation or over various waves of funding based on the availability of funds or other criteria that the state deems important.

The cost to initially connect to a higher bandwidth will range from thousands to hundreds of thousands depending on the site. Some sites may only require a change out of the main router

and/or switching equipment while others may require trenching and installing fiber over long distances. The farther the distance, the more expensive it is to provide fiber unless communications pathways already are established and there is extra space capacity. The state may also find that there are various middle mile projects that will assist a number of outlying districts. In these cases it is necessary to have a team that can recognize these opportunities when they are present.

ESH has specifically targeted repurposing some of the funds that the State of Arkansas spends on its distance learning network to fund the conversion to higher bandwidth networks. It will be important as this possibility is examined to see if eliminating these older lines will affect the current bandwidth levels on which districts now depend. A transition plan will need to be developed to bring additional connectivity before the original connections are terminated.

Ongoing Costs for Broadband Connections

Ongoing connection costs for broadband for schools will vary by the type of connection that currently exists (fiber, copper wire, wireless), carrier rates, the volume of connection, and the additional maintenance contracts held by individual school districts. Because of the dynamic nature of these variations, it is difficult to calculate what the real price of bandwidth for a district may be without a detailed analysis of each of the bills for this service. Because bills are not easily available to the public unless specific records requests are made (Cavanagh, 2013), and because billing information varies by carrier and services provided, creating a uniform cost structure averaged across students requires a specific effort like the RFP generated by the BLR.

The desire to standardize a "cost per megabit-per-second" that could then be translated into per-student allocation is understandably desirable. There is a public perception that bandwidth is a commodity that should be able to be priced the same despite location or situation. What should the schools be paying for a gallon of milk or a megabit of bandwidth? Understanding a cost per megabit would allow districts, schools, or the state to negotiate with carriers to consolidate demand and invoke volume pricing (Northwest Colorado Council of Governments, 2013). However, until districts have the same type of connection through the capital investments spoken about above, it is difficult to understand where savings can be generated.

The cost of bandwidth per megabit varies from under a few dollars a megabit to over a hundreds of dollars per megabit not only in Arkansas but also in other states. The Education Superhighway cites the disparity that they have found in Arkansas bandwidth costs as their four-member team has studied costs over various months. The group found that one school district, Smackover, was paying only $1.50 per megabit through a high-speed fiber connection compared to the $286 per megabit price paid by the Department of Educational Services over their copper-based network. ESH estimates the average cost per megabit in the state is $162 (Brawner, 2014). ESH also worked with Virginia determining that their average cost per megabit was $26, more that the national average of $22 per megabit (Virginia Department of Education, 2014). WMX, a company assessing school districts in Northern Colorado, showed prices per megabit ranging from $6 to $158 (WMX, 2013).

Moving schools from old copper networks to shared fiber networks is not a new concept. Ohio worked to move K-12 schools from old copper networks to a common fiber network consisting of public and private segments and their research network. The state estimates that in the year 2000 schools were paying $480 per megabit compared to the average $9 per megabit they were paying in 2012 (eTech Ohio, 2012). Network Nebraska, the educational network of Nebraska, claims that because of their efforts since 2006, prices have dropped from $87 a megabit to $1.28 per megabit a month on their statewide network which connects to over 94% of their K-12 school districts (Network Nebraska, 2014). While some of these price decreases in these two instances might be attributed to the price of bandwidth decreasing naturally over time, both of these entities feel that their large gains were attributable to creating large educational networks that leveraged buying power and established better transport networks.

To better understand the difficulty of estimating the cost of bandwidth in terms of dollars per megabit per month, the table below summarizes the data presented in the paragraphs above.

	Cost Per Megabit Per Month ($)		
State	Low	Average	High
Arkansas (2014)	1.50	162.00	286.00
Virginia (2014)		26.00	
Colorado (2013)	6.00		158.00
Ohio (2000)		480.00	
Ohio (2014)		9.00	
Nebraska (2006)		87.00	
Nebraska (2014		1.28	
National Average (2014)		22.00	

The great disparity in bandwidth prices seen in the examples above are mainly caused by the type of connection that exists in a specific site. If a site has bonded a number of copper-based T-1 lines to achieve more bandwidth, the cost per megabit will be much higher than the cost would be for the same or greater amount of bandwidth on a fiber connection.

One major reason that districts fail to take advantage of ongoing savings afforded by fiber prices is that in many cases the initial capital outlay lies outside their financial reach. Some districts may be paying higher prices for less bandwidth because they cannot afford the capital cost to move to a cheaper, more reliable, form of transport.

It would not be surprising for legislators to hear complaints from school districts that are attempting to increase their bandwidth capacity over outdated copper lines. The most effective way to offer assistance to these types of districts is to help them make the initial capital investments to bring fiber to their district over the last mile and in some cases the middle mile. The BLR study will clearly indicate what type of connection each district or school has and will carefully outline the cost each is paying per megabit of bandwidth. When these data are known, it will be easier for the legislature or the ADE to look for other variations in cost beyond that caused by connection type. When analyzing the data, researchers will be able to determine whether specific carriers are taking advantage of districts or schools and, as mentioned before,

will be able to analyze where savings are available through bandwidth consolidation or other means. They will also be able to determine if schools are taking full advantage of all E-Rate discounts and if it would be advantageous to change the law to allow K-12 districts and schools to connect to high-speed bandwidth utilizing ARE-ON connections.

Conclusion and Summary

In summary, Arkansas has made a commitment to providing high-speed broadband bandwidth to its K-12 students in school districts and public charter schools. Various processes have already been put in place to build on progress already made. The next significant step to occur is for the financial scope of achieving this commitment to be quantified. The BLR study will provide that basis. Different government officials, committees, outside advocacy groups and others have made suggestions as to who or what organization might implement the process of bringing that bandwidth to students who are without broadband. However, until the BLR results are returned it would be premature to develop a structure before the details of the need are determined.

GLOSSARY OF FUNDING MODEL ELEMENTS

Model Element	Page Number	Definition
Core Teachers	22	Core teachers are the grade-level classroom teachers in elementary schools and the core subject teachers in middle and high schools (e.g., mathematics, science, language arts, social studies and world language, including such subjects taught as Advanced Placement in high schools). Core teachers are provided at the rate of 1 for every 15 K-3 students, and 1 for every 25 grade 4-12 students.
Elective Teachers	24	Elective teachers as all teachers for subject areas not included in the core, including such classes as art, music, physical education, health, and career and technical education, etc. However, some career technical classes can substitute for core math and science classes. Elective teachers are provided at the rate of 20% of core teachers for elementary and secondary and 33% of core teachers for high schools.
Instructional Coaches	28	Instructional coaches, sometimes called mentors, site coaches, curriculum specialists, or lead teachers, coordinate the school-based instructional program, provide the critical ongoing instructional coaching and mentoring that the professional development literature shows is necessary for teachers to improve their instructional practice, do model lessons, and work with teachers in collaborative teams using data to improve instruction.
Tutors	30 and 69	Tutors, or Tier II Interventionists, are licensed teachers who, during the regular school day, provide 1-1 or small group (no larger than 5) tutoring to students struggling to meet proficiency in core subjects.
Extended day Programs	75	Extended day programs provide academic extra help to students outside the regular school day before and after school.

Summer School	77	Summer school includes all programs provided during the summer months, i.e., outside the regular school year, largely focusing on academic deficiencies of students but includes a wider array of classes for high school students
At-risk Students	69	The unduplicated count of students eligible for free and reduced price lunch and all ELL Level 1, 2 and 3 students. The proposed At-Risk weight of 0.2 would include all resources for tutors (Tier 2 Interventionists), extended day programming, and additional pupil support.
English Language Learner services	80	ELL students are those who come from homes where English is not the native language and who perform at Levels 1, 2 and 3 in English; in addition to the At-Risk weight, the model provides resources to provide English as a Second Language services for these students.
Special Education	32	Programs for all students with disabilities.
Alternative Schools	83	Alternative Schools provide services, usually outside of the regular school environment, to students who have some combination of significant behavioral, social and emotional issues, often including alcohol or drug addictions. These students are different from at-risk students and require a different set of services.
Gifted, Talented	44	Gifted and talented students are those who perform in the very top levels of performance, and can handle much more than a year of academic work in a regular school year.
Substitute Teachers	36	There are regular substitute teachers.
Student Support, Guidance Counselors, Nurses	37	These include guidance counselors, social workers, psychologists, family outreach workers, nurses, etc. Guidance counselors and nurses are provided for all students and additional student support staff are provided in the proposed 0.20 At-Risk weight.

Duty/Supervisory Aides	39	These are non-licensed individuals who help students get on and off buses, monitor the hallways, doors and playgrounds, and supervise the lunchroom.
Librarians	40	These are regular school librarians.
Principal, Assistant Principal	41	These are regular school principals and assistant principals.
Professional Development	47	Professional development includes all training programs for licensed staff in schools including professional development for implementing new curriculum programs, sheltered English instructional strategies for ELL students, gifted and talented, etc. It also includes assistance to teachers working in collaborative groups and ongoing coaching of teachers in their individual classrooms. Resources include instructional coaches, 10 pupil-free days for training, and $100 per pupil for trainers and other expenses.
School-Based Technology and Equipment	50	These include within school technology such as computers, servers, network equipment, copiers, printers, instructional software, security software, some curriculum management courseware, etc.
Instructional Materials	54	This includes textbooks, consumable workbooks, laboratory equipment, library books, short cycle/benchmark assessments and other relevant instructional materials.
Student Activities	59	This includes on-credit producing after-school programs, including clubs, bands, sports, and other such activities.
Central Office Administration	65	This is a per pupil amount developed for a prototypical school district of 3900 students and includes all typical central office staff such as superintendent, assistant superintendents, curriculum director, special education, the business and HR functions, assessment & technology, and a director of operations/maintenance.
Operations and Maintenance	61	This is a carry over number of the average 2012-13 expenditures per pupil for these functions.

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APPENDIX
THE SCHOOL IMPROVEMENT MODEL AS APPLIED TO ARKANSAS

When we did our initial work in Arkansas, we relied on a six-point theory of school improvement that would lead to student performance gains (Odden, Picus & Goetz, 2006:4-5):

1. "*Recalibrate goals* for student learning. In order to have Arkansas' students prepared for college, work in the emerging global economy and citizenship, the medium term goal is to double student academic achievement, as measured by the rigorous National Assessment of Educational Progress (NAEP) and the state's testing system. The long term goal is to have at least 90 percent of students – including low income, students of color, ELL and students with disabilities – achieve to proficiency standards.

    a. Our assumption is that work in the global, knowledge-based economy requires the same skills and expertise to enter the work force after high school or to go to college.

    b. We also assume that in the 21st century, career-tech education is info-tech, nano-tech, bio-tech, and health-tech if it is to function to bolster Arkansas' economic growth

2. *Re-engineer schools* to have them deploy more powerful instructional strategies and use resources more productively. Schools need to change the curriculum they use, how they organize instruction and how they use resources ….. One core idea is that all students should take a college preparatory curriculum of 4 years of English, 4 years of history and at least 3 years of mathematics and science.

3. *Redesign teacher development* so that all teachers acquire the instructional expertise to educate all students to proficiency and the ability to think, understand, problem solve and communicate. This means using the extensive professional development resources that are included in the funding model in the most effective ways.

4. *Reinforce achievement for struggling students* by providing a series of extended learning opportunities, such as some combination 1-1, 1-3 and small group tutoring, extended-day and summer school programs, so all students have an opportunity to achieve to high standards. The objective is to hold performance standards high and vary instructional time so all students can achieve to rigorous standards. In this process, schools also will close the achievement gap

5. *Retool schools' technology* so they can tap the educating potential of the Internet

6. *Restructure teacher compensation* so the state begins to move away from paying teachers on the basis of just years of experience and education units, and towards a system that pays teachers individually for what they know and can do (a knowledge and skills-based pay system), and collectively a bonus for improving student learning."

Today, we organize the elements of our school improvement model into ten areas as noted in Chapter 2. In general, we find that schools and districts that produce large gains in student performance follow ten similar strategies, resources for each of which are included in the EB model: