AN EVIDENCE-BASED APPROACH TO IDENTIFYING AN ADEQUATE EDUCATION SPENDING LEVEL IN VERMONT

Prepared for the
Vermont Legislative Joint Fiscal Office

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September 15, 2024

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EXECUTIVE SUMMARY

The level of spending necessary to ensure that students in the public education system achieve educational outcomes that set them up for success is a complicated and hotly debated issue. Driven by the policy and financial conversations in Winter 2023-2024 about the cost of public education and its impacts on property taxes in Vermont, the Legislature commissioned Picus Odden & Associates to update their Evidence-Based Model (EB Model) to estimate how much Vermont should spend to adequately[1] educate public school students and achieve successful outcomes.

Th**e Evidence-Based (EB) Model is designed to identify the array of staffing and resources that high-performance schools need to provide every student with robust opportunities** to meet college and career ready standards. Performing to those standards would substantially improve student achievement and reduce demographic related performance gaps.

Based on the modeling, it is Picus and Odden's professional position that if Vermont provided school funding at the level of the EB Model and if Vermont's schools used the resources in the model as indicated in Chapter 3, then student achievement in Vermont would substantially improve and the cost of education could be reduced.

This study finds that estimated adequate costs for PK-12 education in Vermont are *less* than the current Education Fund Payment, the most appropriate comparison expenditure figure.[2] Depending on the assumptions used for summer school and extended day participation, the EB Model's **estimated adequate spending is $400.4 million to $462.7 million *less* than Vermont's current Education Fund Payment.**

On a per pupil[3] basis, Vermont's 2024 Education Fund Payment was $16,869 per pupil while the model estimates between $12,307 and $12,921 per pupil.[4]

These high-level findings are summarized in the following table:

[1] Adequate is defined as providing a level of resources (with appropriate adjustments for size and geographic cost differences) that would enable schools to provide every student with an equal opportunity to learn to high performance standards.
[2] For a fair comparison, adjustments for educational expenditures not included in the EB Model were made, including estimates for local special education, food service, Debt service, Capital construction, and transportation expenditures.
[3] Throughout this report "Per Pupil" and "Per Student" mean the same thing and are used interchangeably.
[4] The estimate's range depends on the assumption of summer school and extended day program attendance.

	FY24 Vermont Expenditures	EB Model Estimates of Adequate Spending		Difference *(Amount Vermont spending exceeds EB Model's adequate cost estimate)*
		Bottom of range	Top of range	
Education Payment *($ millions)*	$1,711.1	$1,248.4	$1,310.7	$400.4 to $462.7
Per Pupil Education Fund Payment	$16,869	$12,307	$12,921	$3,984 to $4,562

This report describes Picus and Odden's evidence-based approach in detail and provides a framework that could be applied to Vermont's public PK-12 education system. Using educational research, the EB Model identifies the evidence-based programs that elementary, middle, and high schools need to boost student performance. The EB Model then translates those practices into a set of recommendations Vermont can use to determine an Adequate Expenditure Per Pupil figure and related student weights for students from low-income backgrounds and for English Language learning (ELL) students. These figures would allow each "normal" size school to offer all students an equal opportunity to achieve to the state's curriculum and performance standards.

An Excel based simulation accompanies this report and was used to compute the EB per pupil and total derived spending estimates. The simulation estimates an Adequate Expenditure Per Pupil figure, as well as additional dollar-per-pupil figures and weights for students from low-income backgrounds, and ELL students. The simulation also allows users to modify any of the EB elements to produce alternative estimates of these cost figures.

When interpreting the results of this analysis, it is important to note that the model's school and district sizes do not necessarily align with Vermont's current educational landscape. The study leverages academic research to determine the model's prototypical size of schools and school districts and adequate spending levels. These sizes are larger than some (if not all) of Vermont's schools and districts. **The decision to maintain a certain number of school districts and school buildings is a policy choice that influences overall costs.** In other words**, Vermont's current policy decisions to maintain smaller school and districts likely result in higher costs that are not fully addressed in this analysis.**

The next step in using the Evidence-Based model to estimate an adequate expenditure level in Vermont's current educational structure would be to use additional school prototypes. This would require the inclusion of multiple small elementary, middle, and high school prototypes to more precisely estimate what an adequate education expenditure level would be in Vermont given different school and district sizes.[5]

[5] This would align with the Picus Odden & Associates' original report from 2016, "Using the Evidence-Based Method to Identify Adequate Spending levels for Vermont Schools": https://ljfo.vermont.gov/assets/docs/education/adequacy/17e5b10a4a/VT-EB-Analysis-20.1.pdf

CHAPTER 1
INTRODUCTION AND OVERVIEW

INTRODUCTION

Using the Evidence-Based (EB) Model, this document provides a set of recommendations Vermont can use to determine an Adequate Expenditure Per Pupil figure and related student weights for students from low-income backgrounds, for English Language learning students and for students with mild and moderate disabilities. This figure would allow each "normal" size school to offer students an equal opportunity to achieve to the state's curriculum and performance standards. Accompanying this report is a Microsoft EXCEL-based simulation that shows how all the EB recommendations can be combined to estimate the Adequate Expenditure Per Pupil figure, as well as additional dollar per pupil figures and/or weights for students from low-income backgrounds, students classified as English Language Learning (ELL), and students with mild/moderate disabilities. The simulation also allows users to modify any of the specific EB elements to produce alternative estimates of these per pupil cost figures.

This report is an update of the report we prepared in 2015 for Vermont. The report includes new research that bears on the recommendations made for the various elements of the EB Model.

For the past 26 years, Lawrence O. Picus and Allan Odden have worked across the country, primarily with state legislatures, helping states determine how to fund schools adequately. **Adequate is defined as providing a level of resources (with appropriate adjustments for size and geographic cost differences) that would enable schools to provide every student with an equal opportunity to learn to high performance standards**. Over time, as both curriculum and performance standards have been increased and as states have adopted college and career ready standards for reading/language arts, mathematics, and science, the EB Model has been updated to meet the changing and more rigorous expectations of K-12 schools and students attending them.

ORGANIZATION OF THE REPORT

This report contains 4 chapters:

Chapter 1 provides an introduction and overview of the report.

Chapter 2 describes the school improvement model that underlies the EB funding model. This chapter draws from research that has been conducted on schools (including Vermont schools) that have significantly improved student achievement. Such schools exist across the country and vary by location – urban, suburban, and rural – and by school size – large, medium, and small.

Chapter 3 "unpacks" the elements of a high-performance school and includes specific recommendations for every element of the model. Table 3.1 lists all the EB elements and their values for the core EB Model as of 2024. These elements include class size, extra help for struggling students, professional development, student support services (including guidance counselors and nurses), and ways that instruction and teachers can be organized to bolster their effectiveness to increase student performance and reduce achievement gaps linked to student demographics.

Chapter 4 provides the estimated EB determined Adequate Expenditure Per Pupil figure using the accompanying EXCEL-based simulation. This chapter describes how the Adequate Expenditure Pupil figure is used to identify weights for students from low-income backgrounds, for ELL students and for students with mild and moderate disabilities.

In terms of the overall costs of using the EB Model to determine adequate school funding, a national study conducted using 2008 data showed that the EB Model at that time cost just above the average of what was spent on schools across the country in that year (Odden, Picus & Goetz, 2010). The school cases that were studied at that time, and which deployed strategies aligned with the EB Model (e.g., Odden, 2009, 2012; Odden &Picus, 2020), generally produced significantly higher student achievement. **It is Picus and Odden's professional position that if Vermont provided school funding at the level of the EB Model and if Vermont's schools used the resources in the model as indicated in Chapter 3, then student achievement in Vermont would substantially improve.** The following chapter describes the high-performance school that is embedded in the EB school funding model.

CHAPTER 2
THE EVIDENCE BASED SCHOOL IMPROVEMENT MODEL

This report identifies the array of educational programs and resources that would allow Vermont's schools to provide each student an equal opportunity to meet the state's student performance standards, i.e., to identify an Adequate Expenditure Per Pupil figure. As a prelude, this chapter describes the overall school improvement strategy that these resources allow high performance schools to deploy.

The core elements of the EB Model have not changed over the past 20 years. Over those two decades several of the key elements of the model have been supported by randomized controlled trial research, the gold standard of research. As a result, we are more confident today that the EB Model provides a framework for the needed resources for all schools to dramatically improve the performance of all students and to reduce achievement gaps linked to demographics.

No matter what course of studies a high school student completes – college prep or career tech – Vermont's students are expected to achieve to college and career-ready standards. This is necessary to be competitive in today's global, knowledge-based economy after high school or college. This includes children from low-income homes, students of color, English language learners (ELL) and students with mild and moderate disabilities. The basket of educational goods and services and a cost-based funding model to support that basket must be sufficiently robust to allow students in all school districts in the state to have sufficient opportunities to perform to these rigorous standards.

THE HIGH-PERFORMANCE SCHOOL MODEL EMBEDDED IN THE EVIDENCE-BASED APPROACH TO SCHOOL FINANCE ADEQUACY

The evidence-based (EB) approach was developed by Odden and Picus to link strategies and resources in high performance schools to state school funding formulas, a goal long sought by policy analysts, legislators, and school leaders. Odden and Picus have used the EB Model to conduct adequacy studies in over 20 states over the last 2 decades. The EB Model relies on a school improvement model that allocates resources for educational strategies that current educational research finds are linked to improvements in student learning. More detail on the EB Model can be found in the sixth edition of our school finance text,[6] and in the State Studies tab of the Resource section of our Website (www.picusodden.com).

The model relies on two major types of research:

1. Reviews of research evidence on the student achievement effects of the individual educational strategies used in the EB Model. In recent years this evidence has been strengthened by the growing number of randomized controlled trials (RCTs) that have been conducted on the various elements included in the EB Model.

[6] Allan Odden & Lawrence O. Picus. (2020). *School Finance: A Policy Perspective, 6th edition*. New York: McGraw Hill.

2. Case reports of schools and districts that have dramatically improved student performance over a 4–6-year period – sometimes actually "doubling" student performance on state tests (see case studies at www.picusodden.com).

The evidence-based school improvement model includes multiple educational programs and strategies that, if implemented by districts, can be expected to lead to large improvements in academic achievement for all students, and substantial reductions in student achievement gaps linked to demographic variables (Blankstein, 2010, 2011; Chenoweth, 2007, 2009; Hoyer, 2020; Odden, 2009, 2012; Duncan & Murnane, 2014; Petrilli et al., 2022). The 10 school improvement strategies underpinning the approach include:

1. Analyzing student data to become deeply knowledgeable about performance issues and to understand the nature of the achievement gaps. The test score analysis first includes analysis of state test results and then, over time, uses benchmark and short cycle assessments (sometimes called formative assessments) to help tailor instruction to precise student needs and to identify and monitor interventions for struggling students.

2. Setting higher goals, including aiming to educate 95 percent of the students in the school to proficiency or higher on state exams; seeing that a significant portion of the school's students reach advanced achievement levels; and making significant progress in closing the achievement gaps linked to demographics.

3. Reviewing evidence on good instruction and effective curriculum. Successful schools often sunset their previous curriculum, replace it with a different, more rigorous and research-proven, effective curriculum. Over time, they sometimes create their own specific view of the effective instructional strategies needed to deliver that curriculum.

4. Investing heavily in teacher professional development that includes intensive summer institutes and longer teacher work years. Successful schools provide resources for trainers and, most importantly, fund instructional coaches in all schools. These schools also provide time during the regular school day and week for teacher collaborative work groups to use student data and standards-based curriculum to improve instruction.

5. Providing extra help for struggling students and, with a combination of local, state, and federal Title 1 funds, provide some combination of tutoring in 1:1, 1:3 or 1:5 tutor-student ratio formats. Increasingly such schools provide high-dosage tutoring that over time also includes extended school days, summer school and English language development for all English Language Learning (ELL) students.

6. Creating smaller classes in early elementary years, often lowering class sizes in grades kindergarten through three to 15 students, citing research from randomized trials. Sometimes this includes small overall school size as well.

7. Restructuring the school day to provide more effective ways to deliver instruction. This can include multi-age classrooms in elementary schools and block schedules, double periods of mathematics and reading in secondary schools, and intervention blocks of time in elementary schools. This also includes pupil-free time for teachers to work in collaborative teams to create standards-based curriculum units and the instructional

strategies to implement them. Schools also protect instructional time for core subjects, especially reading and mathematics.

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

9. Fostering professional school cultures characterized by ongoing discussion of good instruction and by teachers taking responsibility for the student performance.

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

Our review of the evidence on school improvement is often supplemented with case studies of schools and districts that are dramatically improving student achievement (see Cases of Improving Schools in the Resource link at our website https://picusodden.com/cases-of-improving-schools/). In our 2015 Vermont adequacy study, we prepared 9 such case studies of Vermont schools. Combined, our analysis of current research and our case studies produce a set of resources that we have concluded are adequate for schools and districts to produce large gains in overall student achievement and thus substantial progress towards the student achievement goals of most states, including those in Vermont.

In sum, the schools that have boosted student performance that we and others have studied, deployed strategies strongly aligned with those embedded in the EB Model. These practices bolster our claim that if such funds are provided and used to implement these effective and research-based strategies, then significant student performance gains should follow.

THREE TIER APPROACH

It should be clear that the design of the EB Model 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 with its modest class sizes, provisions for collaborative time, and robust professional development resources. Effective core instruction is the foundation on which the effectiveness of all other educational strategies depend.

- **Tier 2** services are provided to students struggling to achieve to standards *before* being given an individualized education program (IEP) and labeled as a student with a disability. The EB Model 's current Tier 2 resources include one core tutor for every prototypical school and additional resources, triggered by poverty and ELL student counts, for tutoring, extended day, summer school, additional pupil support and ESL services. We further argue that the robust levels of Tier 2 resources allow schools to provide a range of extra help services, that often are funded only by special education programs, that get many modestly struggling students back "on track," and thus reduce the number and percentage of students needing special education services.

- **Tier 3** includes all special education services.

The extra program elements included in the core EB Model provide a robust set of resources to provide extra instructional time for struggling students, before they need an IEP, which should result in a significant reduction in the overall number of students needing special education services.

CHAPTER 3
USING THE EVIDENCE-BASED MODEL TO IDENTIFY AN ADEQUATE PER PUPIL EXPENDITURE LEVEL

INTRODUCTION

This chapter provides the formulas for and funding levels of every element in the EB Model. Recommended formulas and funding levels have been determined through literature review and data analysis. The elements of the EB Funding Model are divided into five sections:

1. Staffing for core programs, which include full-day kindergarten, core teachers, elective/specialist teachers, substitute teachers, instructional facilitators/coaches, core tutors, core guidance counselors and nurses, supervisory aides, librarians, principals/assistant principals, and school secretarial staff.
2. Dollar per student resources for gifted and talented students, professional development, instructional materials and supplies, benchmark and short cycle assessments, computers and other technology, and extra duty/student activities.
3. Central functions, which include maintenance and operations, central office personnel including school computer technicians, and non-personnel resources.
4. Resources for struggling students including at-risk tutors, at-risk pupil support, extended day personnel, summer school personnel, ELL/ESL personnel, special education, career and technical education and alternative schools.
5. Personnel compensation resources including salary levels, health insurance, benefits for workers' compensation, unemployment insurance, retirement, and social security.

Before providing the summary of the EB formulas and elements, we discuss three more general issues necessary to understand how we proceed from school and district level resources to per pupil funding figures: a) student counts, b) prototypical schools and districts, and c) effect sizes.

Student Counts

The EB Model recommends that states use an Average Daily Membership student count (ADM) to distribute general aid.[7] While Vermont uses an ADM count in its funding formula, it differs from this recommendation in two ways. First, Vermont enhances the ADM count through pupil weights that adjust for student and school needs. Second, Vermont uses pupil counts in tax rate calculations, not to determine allocations to school districts. This report differs from the manner that Vermont current law uses student counts, and just addresses the basic ADM count.

The model also needs a measure of the number of students from poverty backgrounds to trigger at-risk specific resources. In the past, this usually has been the number of students eligible for the federal free and reduced-price lunch program. Since districts can now provide free lunches to all students if they have a large number of students from poverty, the count of free and reduced lunch students may not be available in some districts. Further, Vermont has recently shifted to universal school meals and has begun to implement a Universal Income Declaration form. This

[7] ADM generally refers to the average number of students in attendance on a single day.

leaves the question of whether or not to use an alternative indicator. One state, Illinois, provides a good alternative example using the non-duplicated count of children receiving services through the programs of Medicaid, the Supplemental Nutrition Assistance Program, the Children's Health Insurance Program, or Temporary Assistance for Needy Families). We defer to Vermont in how to count students from low-income families.

The EB Model also includes a count of English Language Learning (ELL) students and students with mild and moderate disabilities. This study uses counts of these students as they are currently defined by the state. To ensure that all ELL students receive the extra help resources of the EB Model, we would encourage Vermont to not only collect an ELL student count, but also the number of non-ELL poverty students; all ELL students trigger tutoring, extended day, summer school, ESL, and additional pupil support resources in the EB Model. In addition, all non-ELL poverty students trigger the tutoring, extended day, summer school and additional pupil support but not the ELL resources. The goal is to enable teachers to provide a robust range of extra help resources to all ELL and poverty students but using unduplicated counts of those students.

Prototypical Schools and Districts

A key component of the EB Model – the way it could be used in Vermont and the way it is used in other states to estimate an adequate "foundation" expenditure per pupil level – is the use of prototypical schools and districts. The EB Model identifies resources for prototypical elementary, middle, and high schools, as well as a prototypical district. The model uses specific sizes of schools and districts in order for the prototypes to indicate the relative level of resources in the schools. Although our modeling is based on these prototypes, this does not imply Vermont or any other state should adopt new policies on school or district size. However, as the number and size of schools and districts is correlated to overall costs, interpretation of the results should consider the current number and size of schools and districts in Vermont, compared to the assumptions made in this modeling.

Research on School Size

School sizes differ substantially within and across all states. No state has a specific policy on school size, though some – including New Jersey, North Dakota, and Wyoming – use prototypical school sizes to develop and/or operate their funding formula. A number of other states include "ideal" size configurations for different levels of schools in their facility guidelines – something that clearly creates incentives for specific school sizes.

Research on school size is quite consistent in its conclusions when considering efficiency and efficacy.[8] Most of the research on school size addresses the question of whether large schools – those significantly over 1,000 students – are more efficient and more effective (produce higher student performance) than smaller school units (schools of 300 to 500), and whether cost savings and performance improvements can be identified by consolidating small schools or districts into larger entities. The research generally shows that school units of roughly 400-600 elementary students and between 500 and 1,000 secondary students are the most effective (produce the

[8] Efficiency is generally measured by cost, and effectiveness is generally measured by student performance.

highest level of student performance) and most efficient (at the lowest cost) (Hanover Research, 2015; Lee & Smith, 1997; Leithwood & Jantzi, 2009; Raywid, 1997/1998; Ready & Lee, 2004).

In reviews of scale economies and diseconomies, Andrews, Duncombe & Yinger (2002) and Duncombe and Yinger (2007, 2010) found that the optimum size for elementary schools was in the 300-500 student range, and for high schools was in the 600-900 range. In sum, the research suggests that elementary school *units* be in the range of 400-500 students and that secondary school *units* be in the range of 500-1,000 students.

The Evidence Based Model's Prototypical School Sizes

The EB approach follows this research by identifying resources for prototypical elementary, middle, and high schools with ADM of 450, 450, and 600 respectively. It uses this approach and these prototypes to indicate the relative level of resources in schools, as well as to calculate an Adequate Expenditure Per Pupil figure for Vermont. These prototypical school sizes reflect research on the most effective school sizes, although few schools are exactly the size of the prototypes. Although many schools in Vermont and other states are smaller (and even larger) than these prototypical school sizes, these prototypical sizes can still be used to turn all the school and district-based EB Model elements into a new base per pupil figure, as the new base per pupil figure would be provided for all students in a school or district, whatever the actual size. States such as Arkansas, New Jersey, North Dakota, and Washington have taken this approach.

We are aware of the substantial role very small rural schools play in educating Vermont's children and the fiscal challenges of providing adequate resources for these schools. This study focuses on identifying an adequacy figure based on "normal size" schools in Vermont's larger districts and assumes further adjustments for size, distance, and geographic location will be made through the existing structure, or through a new one that may be developed by others. As described in Chapter 4, while the study made some significant adjustments for the higher costs of smaller schools, the core EB staffing ratios could be more comprehensively applied to multiple smaller school prototypes. This would require additional analysis and is outside the scope of this report.

Additionally, as is shown in Element 20 (see Table 3.1 below), the EB Model begins with a prototypical district size of 3,900, which includes four 450-student elementary schools, two 450-student middle schools, and two 600-student high schools. This configuration is then used to estimate a district-level central office cost per student. The EB prototypes should not be construed to imply Vermont needs to replace all school sites with smaller or larger buildings or break school districts into smaller units; they are used as heuristics to determine the estimated Adequate Expenditure Per Pupil figure.

In our 2015 study, we developed an additional range of prototypical schools that are more reflective of the reality of Vermont. Specifically, the prototypes we developed were PK-5, 6-8 and 9-12. Pre-K in the prototypes was included because preschool is now required in Vermont. While these prototypes did not reflect all of the school organizations used in Vermont, they provide the flexibility to assign resources (and thus costs) to any school.

For elementary schools, we used a prototypical school of 357 students, which is a school of 3 sections of 17 students in each grade PK-5; 17 is the average class size in our core EB prototypical elementary school of 450 students. We also developed a two section and one section elementary school, which are schools with two sections of 17 students per grade (238 total students) or schools with one section of 17 students (119 total students) per grade respectively.

We also used prototypical secondary school sizes of 450 and 600 with additional prototypes established at enrollments of 300 and 150 students. The result was four high school prototypes (600, 450, 300 and 150 students) and three middle school prototypes (450, 300, and 150 students).

It would be possible to use some version of these additional school prototypes in a reestimation of an adequate education spending level that was school-based rather than district based. While this may recognize the variety of small schools and districts in Vermont more fully, it would contrast against other similar analysis we have conducted for other states.

In addition, Vermont has very clear standards on class size that are smaller than the EB Model parameters. We believe the EB class size ratios, when combined with the other teaching staff in schools, meet these standards so have retained the EB core class sizes in our analysis. If Vermont concluded that the EB approach did not meet its class size standards, then it could use the accompanying EXCEL simulation to calculate the additional costs of lower class size numbers.[9]

Effect Sizes

In reviewing the evidence supporting each EB recommendation, the report discusses the impact of studies in terms of "effect sizes." Effect size is the amount of a standard deviation (SD) in higher performance that the program produces for students who participate in the program versus students who do not. An effect size of 1.0 indicates that the average student's performance would move one standard deviation, or from the 50th to the 83rd percentile.

A major issue in education is how to interpret the effect size – is it low, medium, or high? Decades ago, when this issue was raised, treatments tended to be small scale interventions in a controlled context – several students in a laboratory environment. At that time estimated effects were often substantial, sometimes greater than 1.0 standard deviation. Benchmarks for understanding effect size were established in 1969 (Cohen, 1969). Cohen posited an effect size of 0.2 as Small, 0.5 as Medium, and 0.8 as Large.

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[9] Vermont's current academic standards require that, "Classes in grades K-3, when taken together, shall average fewer than 20 students per teacher. In grades 4-12, when taken together, classes shall average fewer than 25 students per teacher. The total class roll of a teacher shall not exceed 100 students, except where the specific nature of the teacher's assignment (such as in certain art, music, or physical education programs) is plainly adaptable to the teaching of greater numbers of students while meeting the educational goals of the program." http://education.vermont.gov/publications/model-policies

During the past two decades, however, when education treatments have been conducted on a much larger scale and in natural settings – often using thousands of students across scores of schools and dozens of districts and sometimes statewide – effect sizes have been smaller (Kraft, 2020). Moreover, such studies today compare a new program treatment to an existing program treatment, whereas in the past the new program treatment was compared to no treatment at all; the result predictably has been smaller effect sizes. Hundreds of randomized controlled trials (RCT) in education have been conducted in recent years with effect sizes almost always below 1.0. Kraft argues that new benchmarks are needed to assess the importance of the effect produced. Kraft proposes the following benchmarks for effect sizes from causal studies of PreK–12 education interventions evaluating effects on student achievement: less than 0.05 is Small, 0.05 to less than 0.20 is Medium, and 0.20 or greater is Large. These proposed benchmarks were based on the distribution of 1,942 effect sizes from 747 RCTs evaluating education interventions with standardized test outcomes. Readers of this document are encouraged to consider these benchmarks in assessing the various research impacts reported on the elements of the EB Model.

2024 CORE EB VERMONT RECOMMENDATIONS

Figures 3.1 and 3.2 offer a graphic approach to understanding the structure of the Vermont EB Model. Figure 3.1 displays the five major expenditure categories included in the EB Model, and Figure 3.1 offers a graphic display of how all of the components of the EB Model fit together. Following the two figures, Table 3.1 provides a detailed summary of the core resources included in the estimated base per pupil expenditure level estimated for 2024 using the EB Model for Vermont.

Figure 3.1: Five Major Elements of the EB Model

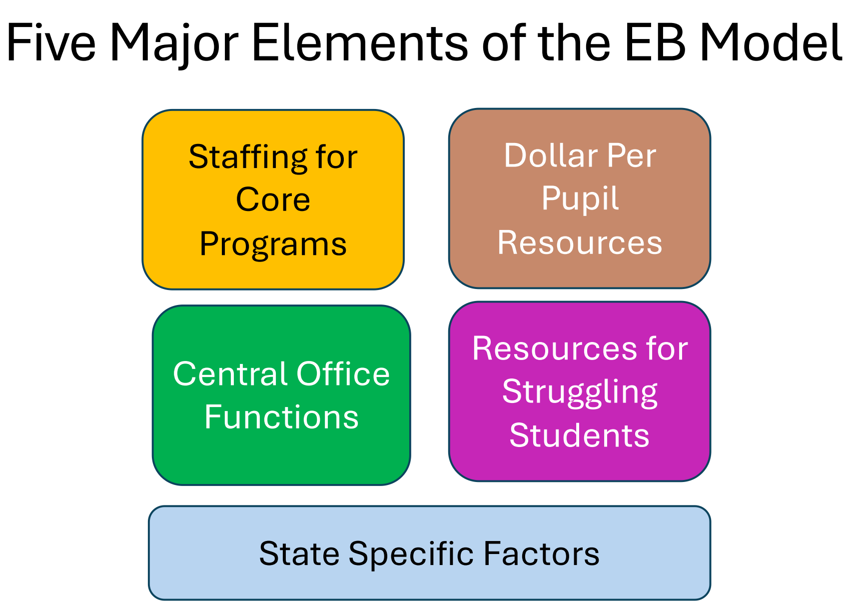

Figure 3.2: Detailed Components of the Vermont EB Model

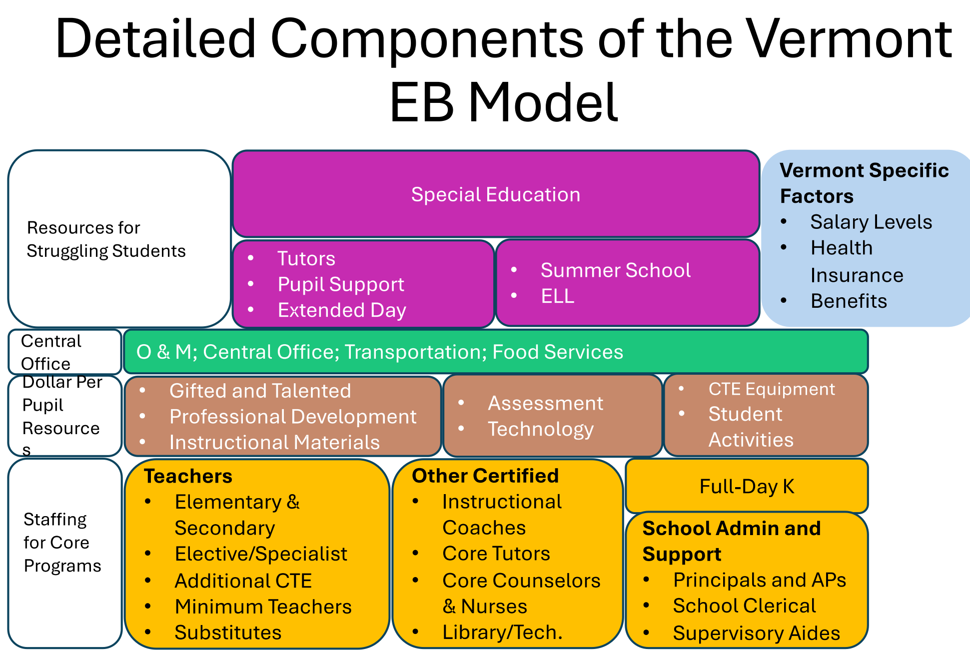

Table 3.1 Summary of 2024 Vermont Evidence-Based Model Recommendations

Model Element	2024 Evidence-Based Recommendation
Staffing for Core Programs[10]	
1a. Preschool	Full-day Preschool classrooms are staffed at a class size of 1.0 teacher and 1.0 aide for every 15 students.
1b. Full-Day Kindergarten	Full-day kindergarten program. Each K student counts as 1.0 pupil in the funding system.
2. Elementary Core Teachers/ Class Size	Grades K-3: 15 Grades 4-5/6: 25 (Average K-5 elementary class size of 17.3)
3. Secondary Core Teachers/ Class Size	Grades 6-12: 25. Average class size of 25
4. Elective/ Specialist Teachers	Elementary Schools: 20% of core elementary teachers Middle Schools: 20% of core middle school teachers High Schools: 33 1/3% of core high school teachers
5. Instructional Facilitators/ Coaches	1.0 Instructional coach position for every 200 students

[10] Note that average Vermont class sizes today are smaller than those reported here which is likely the main reason our estimates are lower than current Vermont education spending.

Model Element	2024 Evidence-Based Recommendation
6. Core Tutors/ Tier 2 Intervention	1.0 tutor position in each prototypical school (Additional tutors are enabled through poverty and ELL pupil counts in Element 21)
7. Substitute Teachers	5% of core and elective teachers, instructional coaches, tutors (and teacher positions in additional tutoring, extended day, summer school, ELL, and special education)
8. Core Pupil Support Staff, Core Guidance Counselors, and Nurses	1.0 guidance counselor for every 450 grade K-5 students 1.0 guidance counselor for every 250 grade 6-12 students 1.0 nurse for every 450 K-8 students and 1 nurse position for every 600 9-12 students. (Additional student support resources are provided on the basis of poverty and ELL students in Element 22)
9. Supervisory and Instructional Aides	2.0 for each prototypical 450-student elementary and middle school 3.0 for each prototypical 600-student high school
10. Library Media Specialist	1.0 library media specialist position for each prototypical school
11. Principals and Assistant Principals	1.0 principal for the 450-student prototypical elementary school 1.0 principal for the 450-student prototypical middle school 1.0 principal and 1.0 assistant principal for the 600-student prototypical high school
12. School Site Secretarial and Clerical Staff	2.0 secretary positions for the 450-student prototypical elementary school 2.0 secretary positions for the 450-student prototypical middle school 3.0 secretary positions for the 600-student prototypical high school
Dollar Per Student Resources	
13. Gifted and Talented Students	$25 per pupil
14. Intensive Professional Development	10 days of student-free time for training built into teacher contract year, by adding five days to the average teacher salary $156 per pupil for trainers (In addition, PD resources include instructional coaches [Element 5] and time for collaborative work [Element 4])
15. Instructional Materials	$256 per pupil for instructional and library materials $60 per pupil for each extra help program triggered by poverty and ELL students as well as special education
16. Short Cycle/ Interim Assessments	$25 per pupil for short cycle, interim and benchmark assessments
17. Technology and Equipment	$250 per pupil for school computer and technology equipment

Model Element	2024 Evidence-Based Recommendation
18. Extra Duty Funds/Student Activities	$360 per student for co-curricular activities including sports and clubs for grades K-12
Central Office Functions	
19. Operations and Maintenance	Separate computations for custodians, maintenance workers and groundskeepers, $1.00 per gross square footage (GSF) for materials and supplies, and $350 per pupil for utilities
20. Central Office Personnel/ Non-Personnel Resources	8.0 professional and 17.0 classified positions for a prototypical 3,900 student Central office. Additionally, $450 per pupil is provided for misc. items such as Board support, insurance, legal services, etc.
Resources for Struggling Students	
22. Tutors	1.0 tutor position for every 100 ELL students and one tutor position for every 100 non-ELL poverty students.
23. Additional Pupil Support Staff	1.0 pupil support position for every 100 ELL students and one pupil support position for every 100 non-ELL poverty students.
24. Extended Day	1.0 teacher position for every 120 ELL and for every 120 non-ELL poverty students.
25. Summer School	1.0 teacher position for every 120 ELL and for every 120 non-ELL poverty students.
26. ESL staff for English Language Learner (ELL) Students	In addition to tutors, extra pupil support, extended day and summer school, noted above, 1.0 ESL teacher position for every 100 ELL students.
27. Special Education	• 8.1 positions for every 100 students, which includes: ○ 7.1 positions per 1,000 students for services for students with mild and moderate disabilities and for the related services of speech/hearing pathologists and/or OT, PT. This equates to approximately one position for every 141 students. ○ 1.0 psychologist positions for 1,000 students (included in the Central Office) • This recommendation results in the following resources at prototypical schools: ○ 3.20 special education positions for every 450-student elementary school ○ 3.20 special education positions for every 450-student middle school ○ 4.25 special education positions for every 600-student high school • 100 percent state funding for services for students with severe and profound disabilities, minus federal Title VIb funds, capped at 2% of all students

Model Element	2024 Evidence-Based Recommendation
28. Career-Technical Education (CTE)	$10,000 per CTE teacher for specialized equipment
Staff Compensation Resources	
29. Staff Compensation	For salaries, Vermont statewide average for all EB staff positions For benefits: in consultation with the Agency of Education, 36.1 % of all salaries for health insurance, social security and Medicare, workers compensation and unemployment insurance. Compensation assumptions are discussed in Chapter 4.

2024 CORE EB VERMONT STAFF RECOMMENDATIONS

This section addresses staffing for core programs, which include full-day kindergarten, core teachers, elective/specialist teachers, substitute teachers, instructional facilitators/coaches, core tutors, core guidance counselors and nurses, supervisory aides, librarians, principals/assistant principals, and school secretarial and clerical staff.

1a. Preschool

Research shows that high-quality preschool, particularly for students from lower income backgrounds, significantly affects future student academic achievement as well as other desired social and community outcomes (Barnett, 1995, 1998, 2011; Camilli et al., 2010; Lynch, 2007; Peterson & Vendell, 2021; Pianta, et al., 2012; Reynolds et al., 2001; Slavin, Karweit, & Wasik, 1994). Indeed, these longitudinal studies show that students from lower-income backgrounds who experience a high-quality, full-day preschool program perform better in learning basic skills in elementary school, score higher on academic goals in middle and high school, attend college at a greater rate, and as adults, earn higher incomes and engage in less socially undesirable behavior. In a long-term study of the High/Scope Perry Preschool Program found that adults at age 40 who were enrolled in the program had higher earnings, were more likely to hold a job, had committed fewer crimes, and were more likely to have graduated from high school than adults who did not have preschool (Schweinhart et al., 2005).

Nearly all of the longitudinal studies of preschool programs have relied on data from three preschool programs that meet the standards now promulgated by the National Institute for Early Education Research (see below): the High-Scope Perry Preschool Program, the Carolina Abecedarian Project, and the Chicago Child-Parent Center Program. These results reinforce the finding that the most robust impacts of preschool programs are those that have studied the effect of high-quality programs.

Research further shows that there is a return over time of *eight to ten dollars* for every one dollar invested in high-quality preschool programs (Barnett, 2000, 2007; Barnett & Masse, 2007; Karoly et al., 1998; Reynolds & Temple, 2008; Reynolds et al., 2011).

Since these early studies, several states have created statewide preschool program. Earlier studies of these programs seemed promising. A 2003 study of state-funded preschool programs in six states—California, Georgia, Illinois, Kentucky, New York, and Ohio—found that children from lower income families start catching up to their middle-income peers when they attend a preschool program (Jacobson, 2003). And a 2007 study showed that preschool programs in New Jersey's urban districts had not only significant short-term cognitive and social impacts, but also long-term, positive impacts on students who enrolled in them, closing the achievement gap by 40 percent in second grade for a two-year preschool program (Frede, Jung, Barnett, et al., 2007).

More recent studies of state preschool programs, however, have reached less optimistic findings. Vermont Agency of Education's (2017) evaluation found the program enacted into law in 2014 produced promising impacts, with greater impacts on literacy than math, but also noted that not all districts had implemented preschool programs and not all programs were effective. Carr et al.,

(2021) found no reliable effects of a North Carolina Pre-K participation for children attending elementary schools with average levels of quality. And Durkin et al. (2022), in a random controlled trial of Tennessee's preschool program, found negative impacts on students in third through sixth grade.

Maloy, Gardner and Darling-Hammond (2019) caution readers about the alleged modest or lack of impact of many recent evaluations of state preschool programs. First, the authors note that the "comparison group" needs to be assessed with critical eyes. The logical comparison is to students who experience no preschool program, when substantial impacts are usually produced, rather than to students experiencing a different preschool program, when impacts are modest or non-existent. The authors also note that low-quality preschool programs rarely produce substantial impacts so studies showing little if any positive impact of low-quality programs should be interpreted to mean that low-quality preschool programs have little effect, not that all preschool programs have little impact.

These findings suggest that attention to quality is key as preschool programs get scaled up across states. However, for 2020-21, the National Institute for Early Education Research found that only six programs in five states met the 10 NIEER program quality standards (Friedman-Krauss, et al. 2023). And one reason quality is in short supply is that state funding for preschool programs has rarely been adequate and has stayed relatively constant for the past several years.

The facts are that only high-quality preschool programs produce positive impacts, and the type of staff is critically linked to program quality (Camilli et al., 2010; Whitebrook, 2004). Therefore, including preschool students in a district's pupil count for state aid purposes is the most straightforward way to fund preschool services. This approach assumes preschool providers pay salaries based on the program's school district salary schedule, or a salary consistent with the state's average teacher salary. In this way, preschool providers can recruit highly qualified teachers for all preschool programs.

Moreover, the National Institute for Early Education Research (NIEER) has established ten quality benchmarks to identify program quality (see Friedman-Krauss, 2023). Its ten "high quality" preschool program standards, all of which can be attained by the EB Model's preschool and related resources, include:[11]

1. Comprehensive learning standards.
2. Teachers with a bachelor's degree.
3. Teachers with specialized training in early childhood.
4. Assistant teachers with a Child Development Associate credential or the equivalent.
5. Teacher professional development of at least 15 hours per year.
6. Maximum class sizes of 20 or less.
7. Staff to child ratios of 1 to 10 or better.
8. Vision, hearing and health screening and referral and support services.
9. At least one meal per day provided.
10. Site visits to ensure program quality.

[11] See https://nieer.org/yearbook/2022

In sum, high quality preschool, offered for a full day and taught by fully certified and trained teachers using a rigorous but appropriate early childhood curriculum can provide initial effects of 0.9 standard deviation that fall to 0.45 in later primary years. By themselves, preschool programs can reduce achievement gaps linked to race and income by half. The effect of preschool programs can be enhanced if followed by high quality education programming in the elementary grades, particularly grades K-3.

Furthermore, there is increasing recognition that preschool should be provided for all students. Research shows that this strategy produces significant gains for children from middle-class backgrounds and even larger impacts for students from lower-income backgrounds (Barnett, Brown, & Shore, 2004).

Despite the importance of preschool, most state school finance systems focus on children aged 5–17. This is largely a function of most state constitutional education clauses that are aimed at that age group. This age-focus does not include preschool, and as a result, under a constitutionally structured adequacy framework, preschool might not be required. Nevertheless, we would strongly encourage all states, as Vermont began to do in 2014, to include preschool in their education policies because of the substantial and long-term impacts of the program for all children particularly those from lower-income backgrounds.

The EB Model provides 1.0 teacher and 1.0 aide position for every 15 preschool students. These staffing resources then function with all other school staff to trigger elective, professional development, and other school wide resources, as discussed below. This allows elementary schools to fully integrate the preschool program into the school, and to create an early childhood teacher team of PK, K, and grade 1 teachers.

2024 Evidence-Based Recommendation: Fund preschool programs by providing 1.0 teacher and 1.0 teacher aid for every 15 preschool students.

1b. Full-Day Kindergarten

Research shows that full-day kindergarten, particularly for students from low-income backgrounds, has significant, positive effects on student learning in the early elementary grades (Cooper et al., 2000, 2010; Fusaro, 1997; Gullo, 2000; Slavin, Karweit & Wasik, 1994). In a late 1990s meta-analysis of 23 studies comparing the achievement effect of full-day kindergarten to half-day kindergarten programs, Fusaro (1997) found an average effect size of +0.77. That same year a randomized controlled trial study (Elicker & Mathur, 1997) found the effect of full-day versus half-day kindergarten to be about +0.75 standard deviations. Cooper, et al.'s (2010) comprehensive meta-analysis reached similar conclusions finding the average effect size of students in full-day versus half-day kindergarten to be +0.25.

These findings were supported by research using data from the Early Childhood Longitudinal Study which found that students who experience a full-day kindergarten program versus students who experience only a half-day, perform better in reading and mathematics (Walston & West, 2004) and that the impact continues into higher elementary school grades (Plucker, East, Rapp, et al., 2004). Studies also find that full day kindergarten positively impacts students social and emotional skills (Cryan, 1992), as well as easing the transition into upper grades (Elicker & Mathur, 1997).

Research in the past several years has reinforced these findings. Hahn, et al (2014) review concluded that that full-day kindergarten improved academic achievement by an average of 0.35 standard deviations over students receiving only a half day program, with the effect being 0.46 for verbal achievement and 0.24 for math. Gibbs (2017) studied a natural experiment in Indiana that randomly assigned students to full-day kindergarten. The results showed significant gains in literacy skills associated with students placed in full-day kindergarten, with the impacts being even greater for “Hispanic" students. Thompson and Sonnenschein (2016) concluded that full-day kindergarten students (as compared to half-day students) had a higher chance of having early word reading skills by the end of kindergarten, which also predicted their higher reading scores in elementary schools. Early word attainment also helped to decrease the demographic related reading gaps. In a 2018 cost benefit study, Ramon, Barnett and Hahn (2018) calculated that, accounting for both the program costs and calculated economic returns, full-day kindergarten programs had a higher net benefit than half day programs, with net benefits being decreased childcare costs, reduced grade retention and remedial education, and increased maternal employment and income.

As a result of these consistently positive research findings on the impacts of full-day versus half day kindergarten, the EB Model supports a full-day kindergarten program for all students.

2024 Evidence-Based Recommendation: Fund full-day kindergarten programs by counting kindergarten students as 1.0 ADM

2. Elementary Core Teachers/Class Size

In staffing schools and classrooms, the most expensive decision superintendents and principals make is on class sizes for core teachers. Core teachers are defined as the grade-level classroom teachers in elementary schools. In middle and high schools, core teachers are those who teach the core subjects of mathematics, science, language arts, social studies and world languages. Advanced Placement (AP) or International Baccalaureate (IB) classes in these subjects are considered core classes.

The gold standard of educational research is controlled randomized trials (CRTs), which provide scientific evidence on the impact of a certain treatment (Mosteller, 1995). The primary evidence on the impact of small classes today remains the Tennessee STAR study, which was a large scale, randomized controlled experiment of class sizes of approximately 15 students 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 students in the small classes of 15 (not a class of 30 with an instructional aide or two teachers) achieved at a significantly higher level (effect size of about 0.25 standard deviations) than those in regular class sizes, and the impacts were even larger (effect size of about 0.50) for low income and minority students (Gerber, Finn, Achilles, & Boyd-Zaharias, 2001; Finn, 2002; Grissmer, 1999; Krueger, 2002; Nye, Hedges, &

Konstantopoulous, 2002). The same research also showed a regular class of 24-25 students with a teacher and an instructional aide *did not* produce a discernible positive impact on student achievement (Gerber, Finn, Achilles, & Boyd-Zaharias, 2001, a finding that undercuts proposals and widespread practices that place instructional aides in elementary classrooms).

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, Gerber, Achilles & J.B. Zaharias, 2001; Konstantopoulos & Chung, 2009; Krueger, 2002; Nye, Hedges & Konstantopoulos, 2001a, 2001b). Related longitudinal research on the Tennessee class size reduction program also found the lasting benefits of small classes included a reduction in the achievement gap in reading and mathematics in later grades (Krueger & Whitmore, 2001).

Although some argue the impact of the small class sizes was derived primarily from kindergarten and grade 1, Konstantopoulos and Chung (2009) found that the longer students were in the 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.

Studies of several statewide programs find smaller effects of class size reductions (e.g., Cho, Glewwe & Whitler, 2012; Molnaar, 1999), but none of these are RCTs and many are “natural variations” rather than specific experimental treatments. Further, studies also often show, not only for class size reduction but also for other strategies, that statewide implementation is not as effective as the initial experiments show. The implication is that states should think seriously about how to structure the implementation of new funds from adequacy studies rather than just providing the dollars to schools without any conditions. Some policy analysts argue that when school funding is tight the costs of class size reduction might not be worth it (e.g., Barnum, 2022; Whitehurst & Chingos, 2011), and others suggest funds for class size reduction might produce larger impacts if states/districts used them to recruit and retain more effective teachers (e.g., Hanushek, 2002).

Though differences in analytic methods, conclusions, benefits versus costs, and policy recommendations, characterize the debate over class size (see also Hanushek, 2002; Krueger, 2002; Schanzenbach, 2020), we concur with those concluding 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.

2024 Evidence-Based Recommendation: Provide class sizes of 15 in grades K-3, and 25 in grades 4-5; these elementary core class sizes produce elementary schoolwide average class sizes of 17.3 for the prototypical K-5 school.

3. Secondary Core Teachers/Class Size

In middle and high schools, core teachers are those who teach core subjects such as mathematics, science, language arts, social studies and world languages. Advanced Placement (AP) and International Baccalaureate (IB) classes in these subjects are considered core classes.

Evidence on the most effective class sizes in grades 4–12 is harder to find than is evidence for the early elementary grades, because most of the research on the effects of class size has been conducted at the early elementary level. As a result, in developing the EB Model, we sought evidence on the most appropriate secondary class size from typical and best practices to identify the most appropriate class size for these grades. The national average class size in middle and high schools is roughly 25 students. Nearly all comprehensive school reform models were developed on the basis of a class size of 25 students (Odden, 1997; 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 several states have recommended secondary class sizes of 20, no individual in a panel we have conducted cited research or best practices to support proposals for secondary class sizes that small. Further, literature reviews rarely find positive impacts of secondary school class size reduction (e.g., Washington State Public Policy Institute, 2013). Citing a few studies, Whitehurst and Chingos (2011) argued there might be a modest linear relationship between improving student performance secondary class size when it drops from between 25 and 30 students to 15, but our view of the evidence and impact is that the gains identified were modest at best, and insufficient to alter the EB Model class size recommendations.

2024 Evidence-Based Recommendation: Provide secondary core class sizes of 25 in grades 6-12

<u>The Difference Between Class Size And Staffing Ratios</u>

The issue of class size and staffing ratios is critical to understanding how the EB Model allocates resources to schools and has a substantial impact on the total cost of the EB Model. In many states and school districts "staffing ratios" are computed by dividing the number of pupils by the number of core ***and*** elective teachers. The result is that a school may report a staffing ratio of 15, but average class sizes will be higher because the number of pupils was separated into two groups: core and elective teachers. In other states and school districts, there can be even more confusion. These states report "pupil teacher ratios" that are computed by dividing the number of pupils by the number of all certified staff – core and elective teachers as well as other certificated staff such as instructional coaches, tutors, nurses and counselors. The result is that a school may report a "pupil teacher ratio" of 12, but average class sizes will be higher because the number of pupils was divided by all certified staff, not just core teachers. These figures are often confusing because staffing ratios, pupil/teacher ratios and class size are frequently conflated when in fact, they have different meanings.

The EB Model is clear that it provides resources for actual class size of 15 or 25, with other instructional and certified staff resourced above that level. To show the difference imagine an elementary school with 300 students. If the school has 20 certified staff members, the pupil teacher (or more accurately pupil/staff) ratio is 15:1. But if five of the instructional staff members are not core teachers, but rather teach electives, are instructional coaches or have other responsibilities, there are only 15 core teachers and the average class size actually would be 20, not the 15 that was reported.

For this reason, the EB Model makes a clear distinction between staffing ratio, pupil/teacher ratios and class size. The intent is to provide positions for actual class sizes of 15 in grades K-3 and 25 in higher grades. In the example above, assuming the class size goal is 15, there would be 20 core teachers and the school would receive additional resources for elective teachers, instructional coaches, and other certificated staff.

4. Elective/Specialist Teachers

There is wide ranging research from scholars across the country documenting how teacher collaborative teams can work during the regular school to improve instructional strategies that boost student learning. To provide this time during the regular school week and day requires a combination of core and elective teachers, resources provided by the EB Model.

In addition to core classroom teachers, the EB Model provides elective or specialist teachers to complement and support core teachers. Generally, non-core or elective teachers, also called specialist teachers, offer courses in subjects such as music, band, art, physical education, health, career-technical education, typing, business, etc. A combination of core and elective teachers has two purposes. The first is to allow schools to offer a full, liberal arts curriculum program with adequate courses outside the core, all of which are needed to cover the broad range of subject matter topics. The April 2017 issue of *Phi Delta Kappan* discusses many issues related to the importance of art and music for our public schools.

The second purpose of providing elective teachers is to allow schools to design schedules that provide pupil-free time during the school day for *all* – core and elective – teachers in order for them to collaborate on instructional plans, participate in professional development activities and otherwise plan for class instruction. Teachers need some pupil-free time during the regular school day to work collaboratively and engage in job-embedded professional development.

Assuming a day is divided into six one-hour periods, providing every teacher with one period a day for collaborative planning and focused professional development requires an additional 20% allocation for elective teachers over core teachers. Using this elective staff allocation, every teacher – core and elective – would teach five of six periods during the day, and have one period for planning, preparation, and collaborative work.

The 20% additional staff is adequate for elementary and middle schools, but the EB Model establishes 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 longer class periods, such as those made available through the use of a block schedule, is an effective way to organize the instructional time of a high school. Typical block scheduling for high schools includes four 90-minute blocks a day where teachers provide instruction for three of those 90-minute blocks and have one block – or 90 minutes – for planning, preparation, and collaboration. This schedule requires elective teachers at a rate of 33 1/3% 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% of the number of core teachers to serve as elective teachers to provide the regular teacher with a "90-minute block" for planning, preparation and collaboration each day.

It should be noted that the EB staffing recommendation for high schools are sufficient for high schools to provide all students with a rigorous set of courses throughout grades 9-12. It allows for an appropriate number of credits required for high school graduation and provides sufficient course taking opportunities for students to be admitted into any post-secondary institution in the country.

Finally, school districts today require a 7.5-hour workday for teachers. Instruction usually comprises five hours of this time, and lunch 30 minutes, leaving 120 minutes for student arrival and departure and possible teacher collaborative time. A 7.5-hour teacher day and the core and elective provisions of the EB Model provide ample resources for districts and schools to provide time for teacher collaborative teams to meet regularly (daily) during the regular school day.

When teachers work in collaborative teams, they review student data to design standards-based lesson plans and curriculum units, identify interventions for struggling students, and monitor all student progress toward meeting performance standards (DeFour, 2015). Teacher led collaborative teams have been identified as keys to improving student performance in several of our school case studies (see case studies at www.picusodden.com) and case studies provided by others (Chenoweth, 2007, 2009.

Other research confirms these case study findings. Labeling teacher collaboration "peer learning," economists Jackson and Bruegmann (2009) found that such teacher collaborative activities were related to student learning gains. Ronfeldt et al. (2015) found that teachers working in collaborative groups boosted student learning over a two-year period in the Miami-Dade school district. Johnson, Reinhorn & Simon (2016) found that the six high-poverty schools in one urban district that had achieved the highest state rating, made teacher teams the central component of its schoolwide improvement strategies and that a key condition was ensuring that the school schedule provided regular, reliable meeting times for teams. Studying school improvement strategies across hundreds of low performing schools in Washington, Sun, Shu and LeClair (2019) found that teachers using student data to improve instruction and target interventions, produced substantial achievement gains. Finally, in a *randomized controlled trial,* Carlson, Borman & Robinson (2011) found that when collaborative teacher teams engaged in data-based decision making by analyzing student data to improve instruction the result was higher student achievement.

Such activities can have other positive spill-over impacts. Using a data base similar to the Miami-Dade data base, Sun, Loeb and Grissom (2017) found that when a more effective teacher becomes part of a teaching team, the performance of other teachers improves, and the performance of the more effective teacher does not drop. This finding suggests that teacher effectiveness can be enhanced when the system strategically ensures that each teacher team has at least one highly effective teacher as a member.

With this combination of teachers, Boudett and Steele (2007) provide several examples of how data-based decision-making teacher groups can be organized and scheduled in schools. Levenson and James (2023) take these suggestions a step further and provide multiple specific ways elementary, middle, and high schools can schedule time during the regular school day to enable such collaborative planning, as well as to provide extra help periods for struggling students. Short and Hirsh (2022) embed these activities into a change process in how teacher teams can function to improve instructional practice focused on implementing new standards-based curriculum programs.

Thus, the EB Model includes both core and elective teachers, making it possible for schools to offer a full liberal arts curriculum and to enable all teachers to engage in collaborative work with their peers during the regular school day and week, the purpose of which is to identify and implement the instructional practices needed to implement new, standards-based curriculum programs and dramatically improve student learning.

The current EB Model provides an additional 20 percent of the number of core teachers as elective teachers for the prototypical elementary and middle school. At the high school level, the EB Model provides an additional 33 1/3 percent of the number of core teachers.

Under the EB Model, the 20 percent formula provides an additional 5.2 FTE positions for the prototypical 450 grade K-5 student elementary school, 3.6 FTE positions for the prototypical 450 grade 6-8 student middle school, and the 33 1/3 percent formula provides an additional 8.0 positions for the prototypical 630 grade 9-12 student high school.

In totaling the core plus the specialist teachers from the recommendations above, the total *teaching* staff for prototypical schools is 31.2 FTE for a prototypical 450 student elementary, 21.6 FTE for a prototypical middle school, and 32 FTE for a prototypical high school.

2024 Evidence-Based Recommendation: Provide 33 1/3% elective/specialist teachers over core for high schools and 20% for elementary and middle schools.

Recommendations in other elements of the model provide a variety of additional staff for all schools. Core and specialist/elective teachers are not the only teaching staff in each school.

5. Instructional Facilitators/Coaches

Instructional coaches, or instructional facilitators (IF), coordinate the instructional program but most importantly provide the critical ongoing instructional coaching and mentoring 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; Knight, 2017). This means instructional facilitators spend the bulk of their time with teachers, modeling lessons, giving feedback to teachers, working with teacher collaborative teams, and helping to improve instruction.

Some instructional coaches may also function as school technology coordinators. providing the technological expertise to fix small problems with personal computer systems, 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.

This report expands on the rationale for instructional coaches in the section on professional development (Element 14) but includes them here as they represent teacher positions.
A few states (i.e., Arkansas, New Jersey, Washington, Wyoming and to a modest degree North Dakota) explicitly provide resources for school-based instructional coaches. Most comprehensive school designs (see Odden, 1997; Stringfield, Ross & Smith, 1996), and EB studies conducted in other states – Arizona, Arkansas, Illinois, Kentucky, Maine, Maryland, Michigan, North Dakota, Vermont, Washington, Wisconsin and Wyoming – call for school-based instructional facilitators or instructional coaches (sometimes called *mentors, site coaches, curriculum specialists*, or *lead teachers*). Further, several comprehensive school designs suggest that while one instructional facilitator might be sufficient for the first year of implementation of a schoolwide comprehensive improvement program, in subsequent years an additional 0.5 to 1.0 FTE facilitator is needed. Technology school designs recommend at least a half-time as the site's technology expert (for example, see Stringfield, Ross, & Smith, 1996). Drawing from this research, the EB Model provides one instructional facilitator/coach position for every 200 students.

Early research found strong effect sizes (1.25-2.71) for instructional coaches as part of professional development (Joyce & Calhoun, 1996; Joyce & Showers, 2002). Several years later, Sailors and Price (2010) found that professional development combined with coaching increased the deployment of comprehensive instructional practices by between 0.64 and 0.78 standard deviations. Newman and Cunningham (2009) found a similar impact on teachers' instructional impact as well as improved reading achievement by about 0.2 standard deviations. A 2010 evaluation of a Florida program that provided reading coaches for middle schools found that teachers who had the benefit of a coach implemented more instructional methods that were linked to improved 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). A study published two years later reached the same conclusions about coaching as part of a program to improve reading (Coburn & Woulfin, (2012).

Positive impacts of coaching are not limited to reading instruction and achievement, however. Indeed, a randomized controlled trial of coaching (Allen et al, 2011) found significant, positive impacts in the form of student achievement gains across all four core subject areas – mathematics, science, history, and language arts. A follow up study with a larger sample of schools and students found similar, large gains, with effect sizes of 0.22 (Allen, et al., 2015).

A 2018 meta-analysis of 60 studies of the causal effects of instructional coaches, found the impact of instructional coaching on instruction was 0.49 SD and 0.18 on student achievement, with the largest number of studies on coaching programs for PreK-5 elementary reading programs (Kraft, Blazar & Hogan, 2018). The bulk of the 60 studies were conducted within the past 10-15 years, many with experimental designs that allowed for causal implications. Cohen, et al.'s (2021) review reached similar conclusions about the effectiveness of coaching.

In their review, Kraft and Balzar found that there was little difference in the effectiveness of coaching provided in person or via video technology. Indeed, both the Allen at al. (2011; 2015) studies researched a web-based coaching system. Knight et al., (2018) found that a coaching approach that used videos of teacher's instruction also was effective. Kraft, Blazar & Hogan (2018) further describe various kinds of instructional coaching and discuss how coaching fits into the core elements of overall professional development (discussed more below in the professional development section). Knight (2018, 2021), one of the countries' leading experts on instructional coaching provides design principles for as well as multiple strategies of effective instructional coaching. Booker & Russel (2022) also provide design principles for recruiting, training, and implementing instructional coaches.

Educators across the country have relied in part on this research to hire increasing numbers of instructional coaches as part of more rigorous school improvement strategies. Domina et al. (2015) found that the number of instructional specialists per 1,000 students doubled from 1998 to 2013 (from about 0.7 to 1.4) and that the percent of districts with no such staff declined from 20% to 7%. The National Center for Education Statistics found that in 2015-16, 66 percent of schools, or nearly 60,000 schools had subject matter specialists or instructional coaches, most in reading, math and science (U.S. Dept of Education, 2015-16).

Though instructional coaching positions are provided as full-time equivalent positions by the EB Model, schools could divide the responsibilities across several individual teachers. For example, the 3.0 positions in a 600-student high school could be structured with six individuals who were half-time teachers and half-time instructional coaches. In this example, each teacher/coach would work 50% time as a coach – perhaps in one curriculum area such as reading, math, science, social studies and technology – and 50% time as a classroom teacher or tutor.

The staffing for instructional coaches recommended by the EB Model, combined with the additional elements of professional development discussed below, are the best way to making Tier 1 instruction (in the RTI framework) as effective as possible, providing a foundation of effective instruction for everyone, including students who struggle more to learn to proficiency.

2024 Evidence-Based Recommendation: Provide staffing for instructional coaches/facilitators at the rate of 1.0 position for every 200 students.

6. Core Tutors/Tier 2 Interventions

The most powerful and effective approach for helping students struggling to meet state standards is individual one-to-one or small group (five maximum) tutoring provided by teachers (Cook, et al., 2015; Elbaum, Vaughn, Hughes & Moody, 2000; Nickow, Oreopoulos, & Quan, 2020; Shanahan, 1998; Wasik & Slavin, 1993). Prior to 2015, we recommended allocating tutors to schools solely on the basis of the number of at-risk students, with a minimum of one tutor position for each prototypical sized school. Since then and especially with student learning loss from the pandemic and more rigorous curriculum and student performance standards, we have recognized that all schools, even those with no at-risk students (as measured by ELL and free and reduced lunch eligibility) have struggling students that need Tier 2 resources. Thus, we augmented the EB Model to provide one *core* tutor position for each prototypical school **as well as** additional tutors based on ELL and poverty student counts (Element 21).

The most powerful and effective extra help strategy to enable struggling students to meet state college and career ready standards is individual one-to-one or small group (five maximum) tutoring provided by licensed teachers (Elbaum, Vaughn, Hughes & Moody, 2000; May et al., 2013, Wasik & Slavin, 1993). Students who must work harder and need more assistance to achieve to proficiency levels 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; Nickow, Oreopoulos, & Quan, 2020; Shanahan, 1998; Shanahan & Barr, 1995; Wasik & Slavin, 1993) with an average of about 0.75. A 2016 meta-analysis of the impact of intelligent, or computer-based, tutoring found that the average effect size was 0.66 across multiple subjects, which increases student performance from the 50^{th} to the 75^{th} percentile (Kulik & Fletcher, 2016), though the effect varied by type of tutoring. Two 2017 meta-analyses of the impact of tutoring found similarly high effects (Fryer, et al., 2017; Dietrichson, et al., 2017), the former with an average effect size of 0.37. A July 2020 meta-analysis of tutoring effects also concluded that tutoring had impressive effects on student learning (Nickow, Oreopoulos, & Quan, 2020) as did a recent meta-analysis of tutoring in mathematics (Pelligrini, 2021).

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; Fryer et al., 2017; Kraft & Falken, 2021) and experts on tutoring practices (Gordon, 2009) have found greater effects when the tutoring includes the following:

- Professional teachers as tutors, or trained college graduates expert in a subject matter
- Tutoring provided to students on a one-to-one basis or in small group with a maximum of 5
- 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 during the regular school day
- Tutoring provided at least three times a week for 45–55-minute sessions
- Highly structured programming, both substantively and organizationally.

Though past research focused on *individual* tutoring, schools can also deploy tutoring resources for effective 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) showed 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 [see also Elbaum, Vaughn, Hughes & Moody (1999) for a meta-analysis of the impacts of small group tutoring]. More recent tutoring efforts have deployed what is called High Dosage Tutoring, which includes groups of 4-5 students with a trained tutor meeting 3-5 times during the week (see Kraft & Falken, 2021).

One-to-one tutoring could be reserved for the students with the most severe learning difficulties, scoring at or below the 20th or 25th percentile on a norm referenced test, or at the below basic level on state assessments. Intensive instruction for groups of three-to-five students would then be provided for students above those levels but below the proficiency level. We expand on a recent manifestation of this approach – called High Dosage Tutoring – in Section 21.

Though most studies of tutoring focused on elementary reading, several effective secondary reading interventions have been developed (e.g., Scammacca, Roberts, Vaughn & Stuebing, 2015) and should be considered by schools as the resources to deploy them are included in the EB funding model. Further, a 2014 randomized control study, (Cook et al., 2014), found substantial positive impacts of a tutoring program for adolescents in high poverty schools if it was combined with counseling as well. This dual approach is made possible in the EB Model as it includes the additional non-academic pupil support resources (see Element 22 discussion).

The tutoring research review by Nickow et al (2020). found that the average effect size was 0.37, which represents movement from the 50th to the 66th percentile, a very substantial impact (Nickow, Oreopoulos, & Quan, 2020). This comprehensive literature review found that tutoring effects were largest for reading in elementary schools and for mathematics in secondary schools, when provided by professionals rather than volunteers, and when provided during the regular school day, not after school.

With the drop in student performance during the COVID pandemic as well as the more rigorous college and career standards that preceded them, educators have argued that substantial numbers of students need extra help. In 2015 we increased the tutor resources in the EB Model from just those triggered by poverty and Ell student counts, to provide one *core* tutor/Tier 2 intervention position for each prototypical school. We continue that addition now that the pandemic has furthered the need for tutoring help. The support the EB Model provides beyond the first tutor per prototypical school is discussed again in Element 21 below.

2024 Evidence-Based Recommendation: Provide 1.0 core tutor position for each prototypical elementary, middle, and high school.

7. Substitute Teachers

Schools need resources for substitute teachers to cover classrooms when teachers are sick for short periods of time, absent for other reasons, or on long-term leave. A common practice across the country is to budget about 10 days of substitute teachers per teacher. Assuming a 200-day work year for teachers, the EB Model provides an additional 5% of all teachers (about 10 days) as resources for substitute teachers. This approach does not mean each teacher is provided 10 substitute days a year; it means the model provides a "pot" of money approximately equal to 10 substitute days per year for all teachers, to be used for covering classrooms when teachers are absent for reasons other than professional development. Professional development recommendations and resources are fully developed in a separate section below (Element 14).

All teachers include: all core and elective teachers, tutors, ELL teachers, instructional facilitators or coaches, teachers for extended day and summer school programs and special education teachers as resources for all schools. In other words, the EB Model adds up all the above teacher positions and then provides an additional 5 percent of those teacher positions for substitute teacher resources; those additional substitute teacher positions are priced at the same level as all teachers on average, or the salary for long term substitute teachers.

2024 Evidence-Based Recommendation: Provide substitute teachers for 10 days for the sum of core teachers, elective teachers, minimum teacher positions, tutors, ELL teachers, instructional coaches and teacher positions for summer school extended day and special education. Resource substitute teacher positions at the same rate as all teacher positions or the salary range for long term substitutes.

8. Core Counselors and Nurses

To address the wide range of non-academic needs of students, a school's staff must include school counselors and nurses, as well as other pupil support staff including social workers, psychologists, family liaison persons, etc. This section addresses just core school counselors and nurses. Additional pupil support staff provided on the basis of counts of struggling students (ELL and poverty students) are described in Element 22 in the section on struggling students.

The need for counselors and nurses today is especially urgent given the changing social, health, emotional and mental conditions of children in America and Vermont, all worsened by the COVID pandemic. Sparks (2019a) reported that there were nearly 1.36 million homeless children attending schools in 2017, a rapid rise over previous decade. The National Center for Homeless Education estimated that approximately 1.28 million students who experienced homelessness during the 2020-21 school year, a slight reduction from 2017.[12] Keierleber (2019) estimated that in school year 2016-17, 1.2 percent of Vermont's school children experienced homelessness. Many homeless children live independently, some live with other families, while others live in shelters and tents. Homelessness reflects not only a lack of housing and living in poverty, but also a life full of uncertainty and various forms of trauma.

Homeless students need more academic as well as non-academic (counselor) help. In 2016-17 only 30 percent of children who experienced homelessness were proficient in reading and just 25 percent were proficient in math (Keierleber, 2019). Homeless students graduate from high school at lower rates than students from low-income households who are not homeless (U.S. Facts Team, 2023). Keierleber also identified a graduation rate of 64 percent for homeless students compared to an average of 77.6 percent graduation rate among other low-income students and a national average of 84.1 percent for all students.

Beyond homelessness, Blad (2019) reported a rise in depression among American students, an increase in suicide efforts and a general uptick in variety of mental illnesses. To be sure, some of these maladies are a result of social media bullying, but the bulk is due to dysfunctional families, poverty, lack of health services, homelessness, and recent immigration status that in many instances include traumas as well. Blad reports that there has been a significant increase in

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[12] Data on students experiencing homelessness included in this report are collected by the U.S. Department of Education through the EDFacts Initiative. To learn more about the EDFacts Initiative, visit https://www2.ed.gov/about/inits/ed/edfacts/index.html.

episodes of deep depression since 2005, with the incidence for school-aged children significantly above the general population. These trends also hold in Vermont.[13]

Burstein, Agostino and Greenfield (2019) document the doubling of suicide attempts by American teenagers over the last decade. Using data from the National Hospital Ambulatory Medical Care Survey, administered annually by the US Centers for Disease Control and Prevention, the study found that the number of children and teens in the United States who visited emergency rooms for suicidal thoughts and suicide attempts doubled between 2007 and 2015. The findings came as no surprise to child psychiatrists, with most saying they knew that suicide and depression had been rising significantly. The findings sadly showed that for America's teens, emotional distress and propensity toward self-harm grew more than for any other age group of Americans over this time period. In 2019, the suicide rate for Vermont young people aged 15-24 at 13.5 per 100,000 population, was just under the national rate of 15, but still concerning.[14]

The COVID pandemic focused more attention on these social and emotional issues. Norman (2022) identified increases in students' social, emotion and behavioral issues after the pandemic. Williams and Drake (2022) documented worsening health and physical issues, delayed vaccinations, decreased access to dental care, adolescent increases in stress, eating disorders, drug overdose, self-harm, and a decrease in social interaction and mental health, all leading to social and emotional issues complicating learning as students entered the 2022-23 school year.

Finally, the physical and medical needs of students also have changed dramatically in recent decades. Rising numbers of students need medications administered during the school day, requiring staff to administer the medications. Our Professional Judgment Panel meetings with educators in multiple states over the past decade confirmed the presence of all the above issues.

The implication of these declining conditions of school children are that schools need more counselors, nurses, psychologists, and perhaps even mental health providers. Indeed, Peterson (2022) reports that since COVID more students are being screened for anxiety, depression and other mental issues, but with insufficient follow through treatment. Unfortunately, only three states provide counselors at the rates recommended by the EB Model and the American School Counselor Association of one counselor for every 250 students. Only three states meet the standard of one school psychologist for every 750 students. And few if any states meet the standard of one nurse for every school or one nurse for every 750 students, promulgated by the National Association of School Nurses (2020).[15]

Counselors

Research shows that well designed and implemented counseling programs can have significant and positive impacts on student learning; progress through elementary, middle, and high school; graduation from high school; and postsecondary enrollment. Carrell and Carrell (2006) found that counselor to student ratios closer to those suggested by the American School Counselor

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[13] https://www.americashealthrankings.org/explore/measures/Depression_a/vt
[14] https://www.americashealthrankings.org/explore/measures/teen_suicide/VT
[15] https://www.nasn.org/

Association reduce disciplinary referrals and the effect is larger for low income and minority students. Lapan, Gysbers, Bragg, & Pierce (2012) found that Missouri high schools that had lower student-to-counselor ratios had higher student graduation rates, a finding that was strongest for schools with concentrations of Title I eligible students. Wilkerson, Perusse, & Hughes (2013) showed that elementary school counselor programs in Indiana that used the model of school counselors developed by the American School Counselors Association produced significantly higher elementary student proficiency rates in math and English/language arts than schools that did not. Carrol and Hoekstra (2013) found that increasing the number of counselors significantly improves boys' academic achievement, with the increases equivalent to increasing teacher quality by an effect size of 0.3. Studies in Connecticut, Indiana and New York found that school counselor programs that reflected the 1:250 ratio of the American School Counselor Association had significant, positive correlations with lower high school student absenteeism and higher SAT math, verbal and writing scores (Parzych, Donohue, Gaesser, Chiu, 2019).

Other studies have found that well designed and implemented group counseling programs, especially for African American and ELL students, can increase those students' achievement scores as well as reduce demographic related achievement gaps (Bruce, Getch, & Ziomek-Daigle, 2009; Leon, Villares, Brigman, Webb, & Peluso, 2011). Carey & Dimmitt (2012) identified the specific counselor activities that led to improved student performance. Davis, Davis and Mobley (2013) show how specific counselor actions can enhance school offerings of and effective minority participation in AP classes. Castlemen and Goodman, (2018) found causative evidence that an intensive college counseling program in Massachusetts targeted to lower income students increased those students' selection of four-year colleges that were less expensive and had higher graduation rates than alternatives students otherwise chose.

In synthesizing, the research on counselor effectiveness, Meyers and Bell (2023) concluded that counselor staffing closer to the ASCA ratios does improve student academic and performance outcomes. In sum, schools that have counselor ratios at or better than the 1:250 figure can produce multiple and positive impacts on students, including increased achievement on state and local assessments, and more success in postsecondary schools.

In a cautionary note, Mulhern (2022), who studied the causal effects of counselors on Massachusetts high school students, found that counselors have varying impacts on students in terms of graduation rates, college selection and persistence. Though, overall, she found that counselors have positive impacts on these variables, she argued that providing effective counselors is more important that just providing more counselors.

In terms of the specifics of the job itself, school counselors provide multiple functions in schools. School counselors help all students:

- Apply academic achievement strategies,
- Manage emotions and apply interpersonal skills, and
- Plan for postsecondary options (higher education, military, work force).

Appropriate duties for school counselors include providing:

- Individual student academic planning and goal setting
- School counseling classroom lessons based on student success standards
- Short-term counseling to students
- Referrals for long-term support
- Collaboration with families/teachers/ administrators/community for student success
- Advocacy for students at individual education plan meetings and other student-focused meetings
- Data analysis to identify student issues, needs and challenges.

Meyer and Bell (2023) report that 30 states mandate counselors for secondary students and that emerging research shows that secondary school counselors can have significant impacts on students, including more success in postsecondary school. The EB Model uses the standards from the American School Counselor Association[16] that recommend one counselor for every 250 secondary (middle and high school) students. This produces 1.8 counselor positions for a 450-student prototypical middle school and 2.4 counselor positions for a 600-student prototypical high school.

While fewer states today require counselors in elementary schools, a growing number of schools in states that do not require counselors at the elementary level have begun to employ them. Meyer and Bell (2023) report that 23 states mandate counselors for elementary students. Further, they identify research that finds that increasing counselors in elementary schools positively impact student behavior and academic outcomes. Consequently, the EB Model today includes one school counselor for the 450-student prototypical elementary school.

Social Emotional Learning

Counselors can also take the lead in developing a school's approach to social and emotional learning, a set of strategies to strengthen students' emotional health, relationship building, behavioral practices and mental health. Though social emotional learning should be thought of more as a schoolwide issue and a characteristic of a school's culture (Mehta, 2020), there are multiple programs and strategies that are known to be effective in improving students social-behavioral competence and mental health (Durlak, et al., 2011; Sheridan, et al., 2019). Levenson (2017) identifies 10 best practices in designing social emotional learning programs. With the robust overall school staffing provided by the EB Model, including core school counselors and additional pupil support staff triggered by at-risk pupil counts in Element 22, schools have the resources to mount comprehensive strategies addressed to enhancing students' social and emotional learning and competencies.

Nurses

School nurses are also critical elements of the variety of pupil support staff today's schools need to address the rising incidence of health, physical, emotional and mental health needs of students. Consequently, the EB Model provides nurses as core positions. Drawing from the staffing

[16] https://www.schoolcounselor.org/

standard of the National Association of School Nurses,[17] the EB Model initially provided core school nurses at the rate of one nurse position for every 750 students. But after working in multiple states and interreacting with dozens of educator panels, we have increased the nurse allocation to 1 school nurse for every prototypical elementary, middle and high school, with additional pupil support staff provided by ELL and poverty student counts as a way for the EB Model to provide even more resources for the social, emotional, health and mental health needs of today's students. Provide 1 school nurse position for each prototypical school.

2024 Evidence-Based Recommendation: Provide 1.0 school counselor position for each prototypical elementary school and 1.0 school counselor position for every 250 middle and high school students. Provide 1.0 school nurse position for every prototypical elementary, middle and high school.

9. Supervisory Aides

The EB Model has consistently provided two supervisory aides positions for each prototypical elementary and middle school, and three supervisory aide positions for each prototypical high school.

Elementary, middle and high schools need staff for non-instructional responsibilities that include lunch duty, hallway monitoring, before and after school playground supervision, and other non-instructional tasks. Covering these duties generally requires an allocation of supervisory aides at about the rate of two supervisory 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 a regular-sized classroom 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. Two studies 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 instructional aides could also have an impact on reading achievement if used to provide individual tutoring to struggling students in the first grade. Neither study supports the typical use of instructional aides as general teacher helpers. And both find that aides have a smaller impact than a licensed teacher. Nickow et al. (2020) also found that paraprofessionals, appropriately trained and supervised, can provide effective tutoring instruction, but their impacts are less than those of teachers.

[17] https://www.nasn.org/

2024 Evidence-Based Recommendation: Provide funding at an amount equal to 2.0 supervisory aide positions for each prototypical elementary and middle school and 3.0 supervisory aide positions for each prototypical high school. EB supervisory aides are not meant to provide instruction, but to relieve teaches from non-teaching duties such as hall patrol, lunchroom monitoring, etc.

10. Librarians and Librarian Media/School Computer Technicians

Most schools have a library, and staff resources must be sufficient to operate the library and to incorporate appropriate technologies into the library system.

The following discusses library staffing in a manner that distinguishes library staff – librarians and library aides– from computer technicians who provide computer technical help to schools. This analysis clarifies how computer technicians evolved from individuals who set up audio-visual equipment for teachers, to individuals who became the first line computer technical helpers and should be considered a separate staff category. These computer technicians typically operate out of the district's technology office and not the library, though they are often supervised when on campus by school principals in schools large enough to generate a full position or more.

Librarians

The importance of the school library as a resource-rich learning center has developed and evolved with the addition of technology. In libraries, students can explore and individualize their learning experience, using all modalities of learning, through access to both electronic and print materials that enhance the curriculum. Both electronic and print materials were previously located primarily in the library, but that has changed. The majority of digital library resources have moved from being available only over school and library networks to being available anytime and anywhere through the internet. This allows students to access the "library" from any place if they have a computer and an internet connection. With this shift, the value of the library as a physical location that provides access to electronic resources has declined, yet this same change enhances the librarian's role as a guide to digital resources, a teacher of digital media literacy, and an important member of the school's instructional literacy teams. The library experience becomes more valuable to students and staff when libraries are staffed with certificated librarians and library aides that help students effectively search, cull, and synthesize information found in books, magazines, and myriad internet resources.

Although the methodology and rigor used in school library research varies, an increased number of library staff and operating hours are generally associated with higher academic outcomes. There is considerable anecdotal data about how librarians may enhance student learning and achievement; however, until recently there have been few empirical studies. Some studies demonstrate positive benefits; yet many of these benefits could be attributed to other sources or resources; it is difficult to establish direct causality (American Association of School Librarians, 2014). Despite these challenges, various research sources report that libraries and librarians can play a role in increasing student achievement.

In 2003, six states conducted studies of the impacts of librarians on student achievement: Florida, Minnesota, Michigan, Missouri, New Mexico and North Carolina. The general finding was, regardless of family income, children with access to endorsed librarians working full time performed better on state reading assessments (Rodney, Lance & Hamilton-Rennell, 2003; The Michigan study found that a school librarian, whether certified or not, was associated with better low-income student achievement, but having a certified librarian was associated with higher achievement gains (Rodney, Lance, & Hamilton-Rennell, 2003). Each state examined the issue differently, but library staffing and the number of operating hours were generally associated with higher academic outcomes.

Statewide studies the following decade also found that school libraries and certified librarians have an impact on student achievement including increasing standardized test scores and student mastery of academic performance standards regardless of school funding levels or demographics (Lance & Hofschire 2012; Coker, 2015; Scholastic, 2016; Curry & Kachel, 2018). Lance and Schwarz (2012) in a study of the impact of certified librarians in Pennsylvania came to the same conclusion and argued that results of 22 other studies documented the positive impact of certified librarians on student performance.

In a meta-analysis of multiple studies, Wine (2020) found that most studies found a positive impact of certified librarians on student performance, with effect sizes ranging from 0.03 to 0.25. She concluded that research finds that full time certified librarians have a positive impact on both students' reading and mathematics achievement scores.

National longitudinal research utilizing data from the years 2005 and 2011 indicated that states that increased the number of librarians over time had greater gains in fourth grade reading scores on the National Assessment of Educational Progress (NAEP) than states that lost librarians (Lance & Hofschire, 2012). Related research emphasizes that the role that the school librarian plays within the school can be more impactful when the librarian is an integral part of the school faculty and acts as a member of the "literacy instruction team" [grade or subject collaborative teams] or as a technology coach (Lewis, 2016; Reed, 2018; U.S. Department of Education, 2017).

Libraries must be adequately staffed and be open to students or groups of students. Research is silent on the number of staff members required to provide adequate service to school staff and students. Because of the lack of literature on library staffing numbers, it is appropriate to examine general practices across states to understand library staffing across America.

The EB Model recommendations for library staff are derived from staffing practices and statutes in other states and from general practice. In 2011-12, through an extensive survey of school libraries, the National Center for Educational Statistics (NCES) calculated average library staff in school libraries at both the elementary and secondary levels (NCES, 2013). In the 2011-12 data, NCES categorized and counted library personnel into three categories: librarians/media (aide) specialists, other professional staff, and other paid staff. Two years later, NCES (2015) again studied library staffing; unfortunately, the data set no longer had the detail of the previous 2011-12 study. The 2015 study only analyzed the number of librarians; it failed to ask if other types of employees such as librarian media (aide) specialists or other professional/paid staff performed librarian functions. The 2015 study also used different school size ranges and did not disaggregate school size ranges by school type (elementary, middle and high). When comparing the two data sets, it would appear that the number of individuals supporting school libraries dropped from 2011-12 to 2015-16; however, if positions other than librarian had been counted in the later data set, the total number of "library staff" may have only changed modestly.

Using data from the 2020-21 school year, NCES (2022) found the average number of school librarians/media staff was 0.9 FTE across all schools. For elementary schools with less than 150 students, the average number of librarians/media staff was 0.6. As the number of students in an elementary school increased to 750 students and higher, the average number of librarians only grew to 0.9 FTE. While the student population more than tripled, total librarians only increased by approximately 50 percent. In middle and high schools, however, schools of all sizes, except those with less than 150 students, had about 1.0 librarian/media staff, and larger schools hired additional librarian/media aides rather than additional librarians. The data imply that once a library has sufficient staff to meet the basic demands such as opening the doors and running the counter, additional personnel are hired at a much slower rate and in many cases not at all, except for very large secondary schools. These practices suggest that providing a full-time librarian for each of the EB prototypical schools, all of which are under 750 students, would follow average national practice.

2024 Evidence-Based Recommendation: Provide 1.0 librarian position for each prototypical elementary, middle, and high school.

School Computer Technicians

The school computer technician position has evolved. Decades ago, these individuals generally were library media aides and set up film strip and movie projectors and portable screens. Their responsibilities evolved into configuring computers and showing teachers how to set up tricky new peripherals like printers and LCD projectors and connecting them directly to classroom computers. As in-school networks were built, these technicians helped create local login names for students who accessed resources on local school servers. Now as network connections among schools, the district, and the Internet have gained capacity and matured, these technicians configure Chromebooks to use the cloud to access educational resources that exist at the district, state, or national level. Computer operating systems have progressed to the point where computers can discover network-available projectors and printers through wireless connections allowing technicians to focus on more difficult issues and to manage the larger local school inventory of computers and devices.

For teachers and other staff to take full advantage of the benefits technology can provide, they need to feel support is close by or a phone call or email away. Having a school computer technician on campus can generate a sense of technological security. The work of the computer technician is cyclical; they are busiest at the beginning of a school year or during the deployment of a new resource or software. After peak demand cycles, technicians can address routine maintenance and other technological housekeeping. Even when moving to a one-to-one computer to student program, with the improvements to hardware, cloud software, and operating systems that have evolved over the last 10 years, the number of school computer technicians generated by the EB Recommendation is common in other states and districts and should be adequate to provide the necessary technical support to students and staff.

General support for computers and for their maintenance and configuration has traditionally been district-based. School sites submit service requests to the district and wait to see when a technician will come. In the EB recommendation, central district technology staff still handle the more difficult issues, while school computer technicians have most of their time scheduled by a district administrator to be at specific campuses. When a site has the ADM to generate a full technician, these individuals may participate at a particular site like a staff member and can be directed during their scheduled time by the principal and/or other site administrators. However, even though these individuals may be at a specific site, the district should be able to redirect them for specific deployments or other cyclical technical needs.

2024 Evidence-Based Recommendation: Provide 4.0 school computer technicians for the prototypical 3,900 student district.

11. Principals and Assistant Principals

Every prototypical school needs a principal. Larger schools need assistant principals as well.

Much has been written about the importance of school principals. Studies of schools that boost student learning always discuss the important role of the principal. Nearly all high performing schools, including those we have studied as part of state adequacy projects, have strong principal leaders. Chenoweth and Theokas (2011) provide one of the most readable descriptions of the various role's principals play in creating and leading effective schools. These roles include instructional leadership, managing the building, creating a culture of respect and high expectations for students and teachers, and managing outside relationships. Principals who want to "get it done," meaning produce large gains in student learning while also reducing achievement gaps, would be wise to read their helpful book, Getting it Done: Leading Academic Success in Unexpected Schools. Studies by the Chicago Consortium on School Research (e.g., Gordon & Hart, 2022) agree with these findings. The Wallace Foundation's work on how principals lead and manage schools for success today extend these findings and contextualizes them to the changes that have occurred in the principalship over the past ten years: increasing numbers of female principals, a decline in the years of experience of principals, and the changing demographics of students and teachers (Grissom, Egalite, & Lindsay (2021). Theoharis (2024) reaffirms these conclusions with a series of case studies showing how principals lead and manage schools to improve learning conditions for all students, improve student performance and reduce achievement gaps.

Neumerski (2012) and Sebastian, Huang, & Allensworth. (2016) review the knowledge about the principal's role in instructional leadership, and updates that knowledge base in relation to current findings on the emerging roles of teachers and instructional coaches – individuals who also provide instructional leadership inside schools. Their studies identify ways the multiple roles play can be integrated to ensure that a robust set of coordinated, direct and indirect instructional leadership functions exist in schools – all of which are compatible with the EB Model 's leadership resources. Chenoweth's (2017) book on cases of schools that improve student achievement provides additional details on the management and leadership tasks of principals who have successfully turned around schools, started effective schools from scratch, or led schools to even higher levels of performance.

Liebowitz and Porter's (2019) review of the impact principals have on critical elements of schools – including student performance – found that principals have large and significant effects on all aspects of schools including: student achievement (effect size up to 0.16 SD); teacher well-being (~0.35); teacher instructional practice (0.35); and school organizational health (0.72-0.81). In a review of numerous studies of the impact of principals on student learning, Grissom, Egalite, & Lindsay (2021) find that the effect of a principal at the 75th percentile of effectiveness is as great as that of a teacher at the 75th percentile. The implication is that principals can have large impacts on student learning but that they need a high level of skills and competencies to produce those effects. These results provide evidence that principals positively impact both instructional leadership and overall school management, so both skills are important for their schools to be effective.

There is no research evidence on the performance of schools without a principal. The fact is that essentially all schools in America, if not the world, have a principal. All comprehensive school designs, and all prototypical school designs from all professional judgment and Evidence-Based studies around the country, include a principal for every school unit (Aportela, Picus, Odden & Fermanich, 2014).

2024 Evidence-Based Recommendation: Provide one principal position for all prototypical schools and provide one assistant principal for the prototypical high school.

12. School Site Secretarial Staff

Schools need secretarial staff to provide clerical and administrative support to administrators and teachers, and to answer the telephone, greet parents when they visit the school, help with paperwork, etc.

The secretarial ratios included in the EB Model generally are derived from common practices across the country. We conducted a search of education literature on school performance for a 2020 adequacy study in Wyoming and our research assistants confirmed that they could not find any research on the impact secretarial staff have on student outcomes; yet it is impossible to have a school operate without adequate staff support.

2024 Evidence-Based Recommendation: Provide two secretary positions for each prototypical elementary and middle school and three positions for the prototypical high school.

DOLLARS PER STUDENT RESOURCES

This section discusses resources the EB Model provides on a dollar per student basis and includes gifted and talented students, professional development, instructional materials and supplies, benchmark/short cycle assessments, computers and other technology, and extra duty/student activities. Most of these elements are non-staff so are included as dollars per pupil.

13. Gifted and Talented Students[18]

A complete analysis of educational adequacy should include the gifted, talented, able, ambitious and creative students, most of who perform above state proficiency standards. Gifted and Talented programs are important for all states whose citizens desire improved performance for students at all levels of achievement.

Research shows that developing the potential of gifted and talented students requires:

- Efforts to discover the hidden talent of low income and/or culturally diverse students so that all deserving students have access to gifted programming,
- Curriculum materials designed specifically to meet the needs of talented learners,
- Acceleration of the curriculum, and
- Special teacher training in how teachers can work effectively with talented learners.

<u>Discovering Hidden Talents in Low-Income and/or Culturally Diverse High Ability Learners</u>

Research studies show 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. A 2019 survey of 800 teachers of gifted and talented students and an additional number of district coordinators of gifted and talented programs found that 60 percent of respondents reported that African American and ELL students were still underrepresented in gifted education; over 50 percent of respondents felt the same was true for children from lower income backgrounds as well as for children with disabilities (Mitchell, 2019). The results suggest the country, and probably Vermont as well, still has a long way to go to meet the needs of all gifted children, especially these subgroups (Harwin, 2019). Access to specialized services for talented learners in the elementary years is especially important for increased achievement among vulnerable students. For example, high-ability, culturally diverse learners who participated in three or more years of specialized elementary and/or middle school programming had higher achievement at high school graduation, as well as other measures of school achievement, than a comparable group of high ability students who did not participate (Struck, 2003). Gains on other measures of school achievement were reported by Struck as well.

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[18] This section draws heavily on Robinson, 2007. See also Odden and Picus, 2020 ford additional citations, as well as the Fordham Podcast with Michael Petrilli, Jonathan Plucker and Amber Northern, (2022). *The Education Gadfly Show #826: Research Deep Dive: What we know about gifted education.* https://fordhaminstitute.org/national/resources/education-gadfly-show-826-research-deep-dive-what-we-know-about-gifted-education. Finally, see Plucker and Callahan (2021 for additional review of what works for gifted and talented students.

Access to Curriculum

Overall, research shows curriculum programs specifically designed for talented learners produce greater learning than regular academic programs. Increased complexity of the curricular material is a key factor. 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; VanTassel-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).

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 over a dozen 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 AP or concurrent college 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 talented student achievement (Gallagher, 1996; Kulik & Kulik, 1984), including AP 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 general classroom teachers make very few, if any, modifications for academically talented learners (Harwin, 2019), 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 adaptations require the support of a specially trained coach at the building level, which could be embedded in the instructional coaches recommended (Element 5). 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 (Delcourt, Loyd, Cornell, & Golderberg, 1994), which could be accomplished with the professional development resources recommended (Element 14).

Overall, research on gifted programs indicates 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). A 2007 review of the research on gifted and talented education reached similar conclusions, finding that in addition to improving achievement among children identified as gifted, many gifted and talented programs also benefit non-gifted and talented students as well as students with disabilities (Field, 2007). A 2016 meta-analysis of 100 years of research on the effects of ability grouping and acceleration on the academic achievement of K-12 students reached similar conclusions about the impacts on gifted as well as non-gifted students (Steenbergen-Hu, Makel & Olszewski-Kubilis, 2016; see also Redding & Grissom, 2022).

<u>Practice Implications</u>

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 gifted students skip grades in order to be exposed to accelerated instruction. Research shows 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. The primary approach to serve gifted students in high schools is to enroll them in advanced courses, such as AP and IB, to participate in dual enrollment in postsecondary institutions, or to have them take courses through distance learning mechanisms. All of these strategies have little or no cost, except for scheduling and training of teachers, resources for which are provided by professional development (Element 14).

<u>A Broader Approach to Giftedness</u>

Over the past several years, we confirmed our understanding of best practices for the gifted and talented *defined as high achievers* with the directors of three of the gifted and talented research centers in the United States: Dr. Elissa Brown, Director of the Hunter College Gifted Institute and previously the Director of the Center for Gifted Education, College of William & Mary; Dr. Joseph Renzulli, The National Research Center on the Gifted and Talented (NRC/GT) at the University of Connecticut; and Dr. Ann Robinson, Director of the Center for Gifted Education at the University of Arkansas at Little Rock.

To broaden gifted and talented education practices, however, the University of Connecticut's Center on the Gifted and Talented developed a very powerful, internet-based platform, Renzulli Learning, which provides a wide range of programs and services for gifted and talented students. In 2005, Renzulli stated that such an approach was undoubtedly the future for the very creative student. 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.

Renzulli (2019) argues that underrepresentation of low income, minority, ELL and students with disabilities in gifted and talented programs begins at the word and definition of "gifted," which usually means identifying very high achieving students. Renzulli argues that many high performing students are different from students who have more creative and productive giftedness, but the latter have the kind of giftedness that is needed for innovation in the evolving global economy. Further, defining gifted as high achieving has the side unanticipated effect of excluding children from non-white, non-middle-income backgrounds, as well as ELL students or students with disabilities.

Renzulli (2019) and Renzulli & Reis (2021) support a different kind of gifted assessment that takes into account the characteristics of creativity and productivity. These characteristics include curiosity, interests, learning styles, expression styles, enjoyment and high engagement learning in particular areas. Equally important are co-cognitive skills such as collaboration, empathy, creativity, planning, self-regulation, and other executive functions skills. These are the kinds of skills that many educators reference when discussing gifted and talented education *and* these are the kinds of skills that lead to major innovations – think Steve Jobs, Elon Musk, Bill Gates. Renzulli Learning is a program that responds to this kind of giftedness. And its cost is modest.

The Renzulli Learning Center describes its program as an interactive online system that provides a personalized learning environment for students, resulting in increased engagement and higher academic performance. Through a comprehensive assessment system, the program quickly identifies student academic strength areas, interests, learning styles, and preferred modes of expression, and then matches each student with thousands of personalized, high interest, engaging educational activities and resources. Renzulli Learning enables teachers to easily differentiate instruction and increase motivation. Renzulli Learning personalizes talent development for each student, giving students the tools and resources to increase engagement and achievement.[19]

Our understanding is that the cost of the Renzulli Learning program today is $15 per student. The company is willing to negotiate school license fees for large schools, generally larger than the EB Model 's prototypical school sizes, that would reduce the overall per pupil cost. Renzulli also offers professional development, and its on-line professional development offerings have become popular. If a figure of $25 per pupil were included in the EB Model, all districts would be able to allow interested gifted, talented, and otherwise creative students to sign up for this program and provide some teacher professional development.[20]

[19] https://renzullilearning.com/
[20] https://renzullilearning.com/en/Menus/33-pricing

2024 Evidence-Based Recommendation: Provide an amount equal to $25 per student to enable all districts to access Renzulli Learning. The online available for Renzulli Learning is particularly appropriate for the rural and isolated schools common in Vermont.

14. Intensive Professional Development

Professional development (PD) includes several important components. This section describes the specific dollar resource recommendations the EB Model provides for professional development. In addition to the resources listed here, PD includes the instructional coaches described in Element 5 and the pupil-free time provided by the provisions for elective or specialist teachers in Element 4. This enables teachers to engage in a range of collaborative activities focused on implementing standards-based curriculum programs and the instructional practices needed for implementation success. Research shows professional development that includes teacher collaboration (Weddle, 2022) leads to improved teacher knowledge and instructional effectiveness. Those staff positions are critical to an adequate PD program along with the resources identified in this section.

Better and more systemic deployment of effective instruction, and related state and local policy supports, are key aspects of an education system that improves student learning (Masters, 2023; Odden, 2011a; Raudenbusch, 2009; Rowan, Correnti, & Miller, 2002; Sanders & Rivers, 1996). To effectively implement today's more rigorous curriculum standards, all school faculty members need ongoing professional development. Improving curriculum and teacher effectiveness through high quality professional development is arguably one of the most important strategies for enabling students to perform to high standards (Short & Hirsh, 2022).

All the resources included in the EB Model need to be transformed into high quality instruction in order to increase student learning (Chetty, Friedman, & Rockoff, J., 2014; Cohen, Raudenbush, & Ball, 2002; Hill & Papay, 2022; Short & Hirsh, 2022). Effective professional development is the primary way those resources get transformed. Further, though the key focus of professional development is better instruction in the core subjects of mathematics, reading/language arts, writing, history, science, and world languages, the professional development resources in the EB Model are adequate to address the instructional needs for gifted and talented, special education, sheltered-English for teaching ELL students, for embedding technology into the curriculum, and for elective teachers as well. In addition, all beginning teachers need intensive professional development, first in classroom management, organization and student discipline, and then in instruction. The most effective way to "induct" and "mentor" new teachers is to have them work in functional collaborative teacher teams.

There is substantial research on effective professional development and its costs (e.g., Crow, 2011; Cohen, et al., 2021; Didion, et al., 2020; Guskey, 2010; Joyce & Showers, 2002; Kraft, Blazar, & Hogan, 2018; Lynch, et al., 2019; Miles, Odden, Fermanich, & Archibald, 2004; Odden, 2011b; Short & Hirsh, 2022; Sims, et al., 2022). Effective professional development is defined as professional development that produces change in teachers' classroom-based instructional practice that can be linked to improvements in student learning. The practices and principles researchers and professional development organizations use to characterize "high quality" or "effective" professional development draw upon a series of empirical research studies that linked program strategies to changes in teachers' instructional practice and subsequent increases in student achievement. Combined, these studies and reports from Learning Forward, the national organization focused on professional development (see Crow, 2011; see also Darling Hamond, et al., 2017), identified six structural features of effective professional development:[21]

- 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. Research suggests effective professional development should be school-based, job-embedded, focused on the curriculum taught and ongoing rather than a one-day workshop.

- The *duration* of the activity, including the total number of contact hours participants are expected to spend in the activity, as well as the span of time over which the activity takes place. 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, when counting PLC hours devoted to instructional practice.

- The degree to which the activity emphasizes the collective participation of teachers from the same school, department, or grade level. Research suggests 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 (i.e., pedagogical content knowledge). Research concludes teachers need to know the content they teach, the common student miscues or problems students typically have learning the content, and effective instructional strategies linking the two. The content focus today should emphasize the content for Vermont's 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. Research has shown 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 coache*s (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, and the development of a professional community. Research supports tying professional development to a comprehensive change process focused on improving student learning.

[21] The more theoretical framework of Sims et al, 2022 align with these six elements.

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 work to embed the new methodologies into their actual classroom practice, with instructional coaches providing support. Active learning implies some degree of collaborative work and coaching during regular school hours to help the teacher incorporate new strategies into his/her normal instructional practices. It should be clear that the longer the duration, the more time is required of teachers as well as trainers and coaches.

Content focus means 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 the content. Today this means a curriculum program to ensure students are college and career ready when they graduate from high school. Collective participation implies 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 build a professional community.

Coherence suggests 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 professional development opportunities should be given as part of implementing new curriculum and instructional approaches, today focusing on Vermont's curriculum standards. There is little support in this research for the development of individually oriented professional development plans; 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.

In a 2016 review of the research on effective professional development, Kennedy (2016) generally identified the same structural features of effective professional development as outlined above. She also noted that when effective, the impact of a professional development program is usually stronger in the year following the program and the impact can increase even after that [for examples, see Horn (2010) and Allen, et al. (2011, 2015)]. Her review included only programs lasting at least a year, whereas many less effective professional development programs are much shorter in duration. The take-away, we believe, is that professional development needs all the programmatic features identified above, should last at least a year long, and should include intensive coaching of individual teachers in their classrooms – resources for all of which are included in the EB Model.

We also refer readers to three documents that provide more detail on how to use the EB identified resources to design and implement all the elements of an effective teacher professional development system (Hill & Papay, 2022; Short & Hirsh, 2022: Masters 2022). These new documents provide more details about the design of an effective teacher learning system. The Short and Hirsh article identifies the professional learning processes needed to implement new and more rigorous curriculum programs into the various phases of the “change process” that are needed to move teachers from what and how they are now teaching to the more rigorous curriculum programs and related instructional strategies needed to effectively implement them.

In support of these findings, we reference an important analysis of the kinds of professional development that work for implementing STEM classes in schools, a national priority. Lynch et al., (2019) assessed results from 95 experimental and quasi-experimental studies of PreK-12 science, technology, engineering and mathematics professional development and curriculum programs. They found an average effect size of 0.21 standard deviations on student performance when the professional development specifically:

- Helped teachers learn to use the new curriculum materials,
- Focused on improving teachers content knowledge, pedagogical content knowledge and/or understanding of how students learn that content,
- Included summer workshops, and
- Included time during the school year for teacher groups to trouble shoot and discuss classroom implementation.

These findings provide specific support for several of the key elements of effective professional development outlined above plus the need for teacher collaborative groups during the school day/year. Finally, the meta-analysis also found wide variation in professional development program implementation and stressed that “fidelity” of implementation of all the elements of professional development is key to having the program produce the desired impacts on teachers’ instructional practice and then student achievement.

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

- Ten days of student free time for training embedded in the salary level, and
- Funds for training and miscellaneous costs at the rate of $156 per student.

The resources for student free time and cost of training are in addition to instructional facilitators/coaches (Element 5) and collaborative work with teachers in their schools during planning and collaborative time periods (Element 4).

2024 Evidence-Based Recommendation: 10 days of student free time for training embedded in salary levels and $156 per student for trainers other than the district’s own instructional facilitators/coaches.

15. Instructional and Library Materials

The need for up-to-date instructional and library materials is paramount. Newer materials, whether digital or print, contain more accurate information and incorporate the most contemporary pedagogical approaches. Common standardized print and digital materials offer a structure, an order, and a progression in the teaching and learning process that allow teachers to pace instruction and work together as a collaborative team. Almost all traditional print textbooks now include supplemental digital data and/or media that are delivered with the teachers' edition or can be downloaded from the internet. Many companies offer completely digital versions of their textbooks that can be accessed anytime or anywhere. Districts in about half the states have organized digital, royalty-free, high-quality, open educational resources (OER) to supplement or provide portions of the curriculum (Bentley, 2019; Fletcher, Schaffhauser, & Levin 2012). Newer curriculum materials are critical today as school systems shift to more rigorous college and career ready standards. To ensure that materials are current, nearly half the states have instituted adoption cycles in which they specify or recommend texts that are aligned to state learning standards (Education Commission of the States, 2013). 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 due to lack of funding.

This analysis addresses two issues: instructional materials and library materials.

Instructional Materials

Access to standards-aligned instructional resources is critical for teachers and students. However, standards do not delineate any particular curriculum, teaching practice, or assessment method. Just under half of states have instituted adoption cycles in which they specify or recommend texts aligned to state learning standards (Education Commission of States, 2022). These cycles range from five to seven years. Textbook adoption is a time consuming, labor-intensive process and requires specific expertise. Without state encouragement, these important decision processes can be delayed by districts for extended periods, and/or conducted without the level of expertise that can be brought to bear through a state level approach, to the detriment of the instructional programs and student learning.

Consideration: Vermont currently does not have a textbook adoption cycle and should consider a textbook adoption cycle as a mechanism for helping schools and districts provide students with up-to-date, relevant and reliable information aligned with a review of subject matter standards.

Up-to-date textbooks and materials, whether digital or print, are expensive. The type and cost of instructional materials may also differ across elementary and secondary levels. Textbooks at the secondary level are more complex and bigger, and thus more expensive. Elementary grades, on the other hand, use more workbooks, worksheets and other consumables. Both elementary and secondary levels require extensive pedagogical aides such as math manipulatives and science supplies that help teachers demonstrate concepts using different pedagogical approaches.

Textbook prices vary widely. At the high school level, textbooks can cost from $80 to $160. Most major textbook companies now offer electronic versions of their texts; however, contrary to popular belief, these versions can be more expensive than the paper-based texts. Some digital versions are offered with time-bound contracts, much like library database subscriptions, while others may require the purchase of the paper texts with the digital license. Most digital-only materials from standard publishers are the same price or are only marginally discounted from the paper-based version. Many publishers will offer to sell the paper-based texts with the electronic version for a 20 to 30 percent premium.

Unless Vermont decides formally to fund a one-to-one student computer program, it is not practical to rely exclusively on electronic-based textbooks. One-to-one programs also rely on home-based internet connectivity. Until a one-to-one computer program is funded and the infrastructure provided to operate it, it is necessary to continue to purchase paper-based textbooks to ensure all students have access to curriculum-appropriate resources.

Considering the move to more rigorous curriculum standards, districts should focus on purchasing curriculum and instructional materials that will assist teachers to drive student success. These new standards require more reading from information texts across all curricular subject areas. This necessitates the purchase of additional materials that have not been required prior to the implementation of the more rigorous curriculum standards adopted across the country. Thus, the EB Model has provided $170 per student, an amount sufficient to allow school districts to use a six-year standard adoption cycle.

With more rigorous curriculum standards as a backdrop, the EB Model recommendation is to create one unified support amount for instructional materials at all schools regardless of school level. Resources of $170 per student per year have supported the purchase of instructional materials that are best organized to support needed teaching strategies. This funding level has also allowed the purchase of digital access to some textbooks if districts desire to adopt and/or experiment with digital access to textbook materials. If combined with a regular adoption cycle, this annual allocation would allow districts to focus on purchasing new curricular materials for one subject area a year, including textbooks and supplementary materials, all of which are needed to enable teachers to raise student achievement.

It goes without saying that textbook selection substantially determines the specific curriculum a school will teach. And the fact is that some curriculum and instructional programs are more effective than others. Though a complete review of curriculum programs is beyond the scope of this report, which is focused identifying adequate resources to purchase needed curriculum materials, it is important that districts and schools use the funds for instructional materials to select textbooks, curriculum, and instructional programs that research finds effective. The What Works Clearinghouse (https://ies.ed.gov/ncee/wwc/) provides evidence-based guidance for how various subjects can be taught at different school levels, as well as identifies research-based effective curriculum programs.

Reading is a special issue. There is nearly universal agreement that reading is key to learning in *all* subject areas. But despite broad agreement on the recommendations of the 2000 National Reading Panel (National Institute of Child Health and Human Development, 2000) that provide the outlines for a science-based reading program, studies and surveys over the years have found that science-based reading practices are not evident in the bulk of the nation's classrooms. For example, in a study of whether teachers were implementing science-based reading practices in Tier 1 instruction, Kretlow and Helf (2013) found that most teachers were not using those practices. In a 2019 survey conducted by Education Week's Research Center, Sawchuk (2019) also found that most teachers were not using science-based reading practices. Sawchuk further found that the non-science-based practices teachers used were often deployed under the banner of "balanced literacy" *as well as* recommended by mentors, coaches, professional groups and teacher training institutions.[22] Lucy Calkins, one of the country's leading reading experts who supported balanced literacy, has recently admitted that such an approach to reading needs to be changed and that successful reading programs must systematically include phonics and phonemic awareness, particularly at the early grades (Education Week, 2020). Moreover, the need for schools to use a science-based approach to reading has been discussed in several articles in Education Week, in the New York Times, and even in *The Economist* (2021).

Schmoker (2019) cautions against one classroom organizational strategy that dominates elementary reading instruction: multiple, reading level-based student groups. Even though literacy instruction usually consumes a large portion of the instructional day for elementary students, Schmoker finds that literacy instruction rarely includes the most essential elements of science-based reading instruction – whole class direct instruction, even when educators agree with those practices! The culprit: multiple ability leveled reading groups rather than whole class, direct instruction. Schmoker, who is one of the country's top professional development consultants, says,

> The most successful K-3 teachers … use small groups sparingly! That is because their *whole class instruction* consistently incorporates the proven effective, but rarely used, elements of successful teaching. They master simple techniques for ensuring that all students are attentive, and conduct frequent, ongoing assessments of the class's progress through the lesson and reteach accordingly.

Relatedly, in a 2018 meta-analysis of a half century's research on the impact of whole-class "direct instruction," Stockard, et al. (2018) found significant positive effects on: 1) reading, language, spelling, mathematics, and other academic subjects, 2) ability measures, and 3) affective outcomes. The results showed that such impacts were maintained over time *and* were even greater when students had more exposure to such direct instructional programs.

To spur the use of science-based reading programs, states are creating statewide initiatives to help teachers, schools and districts adopt and implement science-based reading programs (Olson, 2023). Mississippi, Tennessee, North Carolina, and Arkansas are leading these state efforts. These state programs include curriculum materials, summer training institutes, ongoing professional development with instructional coaches, and extra-help strategies to help struggling students perform to grade level standards. Teachers and their unions have concluded that it is critically important for districts and schools to adopt elementary reading materials that allow teachers to implement a *science-based* reading program (see for example, Moats, 2020).

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[22] Balanced Literacy has become the modern way for many former proponents of the "whole language" approach to acknowledge the importance of phonics and phonemic awareness, but too often "balanced literacy" in practice provides only a cursory and unsystematic use of instruction in phonemic awareness and phonics.

Similar pedagogical advice applies to tutoring. For example, Torgeson (2004) argues that structured reading programs, which specifically, systematically, and directly address phonemic awareness and phonics, have been shown by multiple researchers to be more effective than other approaches, especially for children from lower income and ELL backgrounds. Pedagogy also matters for mathematics programs and instructional practices. Many effective schools have used textbooks that integrate problem solving with concept instruction together with an emphasis on arithmetic basics. Further, a 2015 study concludes that early elementary children with mathematics difficulties are best served by teachers who provide substantial direct mathematical instruction and routine practice and drill on math facts (Morgan, Farkas & Maczuga, 2015). The fact is that some instructional materials are more effective with some or all students than others, and districts and schools should select specific programs only after careful analysis and review to ensure that funds for instructional materials are spent wisely and address the specific needs of their students.

<u>Library Materials</u>

The NCES (2015) reports the average national expenditure for library materials in SY 2011-12 was $16 per pupil, excluding library salaries. These are the most recent figures reported by NCES. Over 90% of the $16 was spent on book titles and the rest on other resources such as subscription databases. The use of electronic databases has declined in recent years as many instructional resources are offered free to the public on the Web.

Electronic database services allow librarians to strengthen print collections and at the same time ensure students have access to electronic data bases that provide more reliable data and information than they might identify only on easily available websites. Electronic data base services vary in price and scope and are usually charged to school districts on an annual per student basis. Depending on the content of these databases, costs can range from $3 to $10 per database per year per student.

Using these two cost estimates – library materials and data bases – to adequately meet the needs of school libraries, we have previously recommended funding of $40 per student for library materials, data bases and electronic services. Adding this $40 per student to the $170 per student amount for instructional materials brings the earlier total to $210 per student for instructional and library materials. Inflation since 2015, when we last updated the library, data bases and electronics services costs, has been 30 percent, which increases those costs to $52 per pupil. Inflation since 2020, when we last estimated the instructional materials cost, has been 20 percent, which brings the instructional materials figure to $204, leading to a 2024 estimated cost of these items $256 per pupil.

2024 Evidence-Based Recommendation: Provide an amount of $256 per student for instructional and library materials. Also, provide an additional $60 per pupil for each student eligible for the five extra help programs discussed below.

16. Short-Cycle/Interim Assessments

Nearly all states administer summative assessments in the spring of each school year (Education Commission of the States, 2020). These assessments indicate the level of student performance in select core subjects, usually English language arts, mathematics, and science. Summative assessments – necessary tools to help schools make high-level decisions about the school improvement process – exist alongside a series of other types of assessment data such as benchmark and short cycle assessments, which serve other, more targeted purposes.

Data-based decision making has become a core and important element in school reform and improvement over the past two decades. It began with the seminal work of Black and William (1998) on how teachers can use ongoing data on student performance to frame and reform instructional practice, and continued with current best practices on how professional learning communities use student data to improve teaching and learning (DuFour, 2015; DuFour, et al., 2010; Hamilton, et al., 2009; Steiny, 2009). The goal is to have teachers use student performance data to inform their instructional practice, identify students who need interventions, progress monitor the effectiveness of those interventions and improve overall student performance (Boudett, City & Murnane, 2007). As a result, data-based decision making has become a central element of schools moving the student achievement needle (Odden, 2009, 2012).

Research on data-based decision making has documented significant, positive impacts on student learning. For example, a 2011 randomized controlled trial study of such efforts showed that engaging in data-based decision making using interim assessment data improved student achievement in both mathematics and reading (Carlson, Borman & Robinson, 2011).

Several researchers -- Datnow and Park, 2014, 2015; Hamilton et al. (2009); the late Richard DuFour (2015), one of the country's experts on teacher collaborative work using student data; and the Carnegie Corporation (Short & Hirsh 2022) – have summarized the research on, and structures of, effective data-based decision-making mechanisms. All rely on access to comprehensive interim and short-cycle assessment data.

To engage in data-based decision making, schools typically use four types of assessment data:

- State summative assessments
- Benchmark assessments
- Short-cycle assessments, and
- Formative assessments.

Schools often start their improvement processes by analyzing the summative assessment data. Analyses of the state accountability (end-of-the-year summative assessments) tests provide a good beginning basis for schools to redesign their overall educational program. But, in order to plan, implement and monitor progress toward higher levels of performance and achieve success in reducing demographics-related achievement gaps, schools need additional assessment data.

One of those additional assessment tools is generally called a "benchmark" assessment. Benchmark assessments are closely aligned with the state's summative testing system and are usually administered in the fall and winter as well as the spring. Fall assessments indicate where students start the year in terms of performance on state content areas. Winter assessment results show progress half-way through the year toward proficiency, which then is measured by the end-of-the-year summative assessment. Benchmark assessments give feedback on each semester of instruction and are often used to determine which students need interventions or extra help.

A third assessment tool is generally referred to as a "short-cycle" or "interim" assessments. These interim assessments are often computer adaptive tests that are given in shorter cycles – every three to five weeks. These assessments most often are used to progress monitor the effectiveness of interventions for students, including those with IEPs. Short-cycle assessments also provide the bulk of the data teachers use to engage in collaborative, student-data-based decision making. Short-cycle assessments also generally include screeners, or micro-diagnostic tools, that identify student knowledge with respect to specific reading and math skills. Short-cycle interim assessments are also frequently linked to a "learning progression" of specific content areas, with test results providing teachers with micro-information on how to lesson plan for specific curriculum units, deliver instruction with strategies tailored to the exact learning status of the students in their own classrooms, and gauge individual student progress toward proficiency in the standard being covered in the unit.

A fourth assessment tool, called a "formative" assessment, is administered over shorter time periods, usually several times during the teaching of a curriculum unit – sometimes daily. Often, teachers themselves create formative assessments. Used in addition to the previous assessment tools, formative assessments provide teachers with information to help identify additional student learning needs so teachers can improve their instruction. All of these additional assessment tools are used by schools that are successful in moving the student achievement needle.

Examples of "short-cycle" assessments include STAR Enterprise from Renaissance Learning (www.renaissance.com), an online, computer adaptive system that provides data in reading/ literacy and mathematics for grades preK-12. Many Reading First schools and many schools we have studied (Odden & Archibald, 2009; Odden, 2009) use the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) assessments (http://dibels.uoregon.edu). Fast Bridge is a third example of a short-cycle assessment. The NWEA MAP program, used by numerous states and districts across the country, has been expanded to provide short-cycle assessment data. These examples include screeners for both reading and mathematics. The Galileo Assessment system as well as the Diagnostic Reading Assessment (DRA) are further examples of these needed assessments.

The costs of these assessments are modest and have changed very little over time. The EB Model provides $25 per pupil for such assessment capabilities. This capacity enables teachers to obtain interim assessments for PLCs, screeners, progress monitoring, and/or overall instructional improvement. This figure also allows for some provider professional development.

2024 Evidence-Based Recommendation: Provide $25 per student for short-cycle assessments.

17. Technology and Equipment

Schools have committed to embed technology into instructional programs and school management strategies. Today, states and districts expect students to be technologically proficient when they graduate from high school. Virtual schools, online tutorials, blended instructional strategies, flipped classrooms, and electronic collaborative environments have changed the face of how students are educated (Whitmire, 2014). Infusing technology and online teaching into traditional schools can provide individualized learning and move the teacher into the role of an instructional coach (see Odden, 2012). Research shows technology engages students and can be effective in schools with high concentrations of lower income and minority students (U.S. Department of Education, 2017; Whitmire, 2014). The COVID-19 pandemic emphasized the critical importance technology can play in the education of students. But research shows that online learning during the COVID pandemic was not very effective (Johnson, et al., (2023).

Infusing technology into the school curriculum has associated costs for computer hardware, networking equipment, software, training, and personnel associated with maintenance and repair. If devices and software are not maintained and updated, teachers and students can become disengaged by "dated" devices and learning opportunities can be lost.

Technology has both direct and indirect costs. This *Technology and Equipment* section focuses on direct costs such as hardware, software, and personnel costs for repairing and maintaining infrastructure and devices. Other EB Model elements incorporate the indirect cost of technology including professional development and school computer technicians to help with keeping school-based technology in working order.

Like other states, Vermont schools have a variety of computers of varying ages that are connected to school networks and the internet. Schools are wired and most are adding Wi-Fi capabilities and increasing bandwidth. The EB recommendation assumes major capital expenses such as bringing high speed internet to the school site and wiring the school have been or will be paid for with school or state capital construction funds.

The EB recommendation for computers and related equipment has held constant at $250 per student for many years. This has been possible because as technology advances, the cost of devices and other equipment drops, even though technology and software needs expand. This analysis estimates four categories of technology costs totaling $250 per student (see the analysis of Scott Price in Odden, 2012; Odden & Picus, 2020). The amounts by category should be considered flexible, as districts and schools need to allocate dollars to their highest technology priority outlined in state and district technology plans. We checked with our expert on technology costs, Dr. Scott Price, who stated that the $250 per pupil figure is still accurate, though districts are spending more on data security than in the past.

The per-student costs for each of the four subcategories have been approximately:

- Computer hardware: $74
- Operating systems, productivity and non-instructional software: $69

- Network equipment, printers and copiers: $55
- Instructional software and additional classroom hardware: $52.

The overall $250 per student figure has been adequate for schools to purchase, upgrade and maintain computers, servers, operating systems and productivity software, network equipment, and student administrative and financial systems software, as well as other equipment such as copiers. System software packages vary dramatically in price; the figure recommended would cover medium priced student administrative and financial systems software packages.

The $250 per student figure allows a school to have one computer for every three students with additional computers for teachers, the principal, and other key school-level staff.

Over the last few years, computer makers have developed alternative products, such as Chromebooks and tablet computers that have a lower entry price point of about $300 per unit compared to the $500 to $800 cost for laptop or desktop computers. These lower-cost devices are designed with limited hardware specifications that still allow students to access cloud-based internet applications effectively but do not require extensive device computing power or memory. For school districts that value increasing student access to technology, purchase of these lower-cost devices provides an opportunity to lower student-to-computer ratios. Indeed, many districts purchased Chromebooks to provide students with the technology needed to engage in on-line learning during the pandemic.

Though Chromebooks use a different operating system than has typically been used in the educational environment, most instructional and interactive testing software is browser-based and housed in the cloud, making these software packages agnostic to operating systems. Additional software is being continually developed for these platforms as they become more commonly used in the educational space. One limiting issue of an internet device like a Chromebook is that if there is no internet connectivity available, then cloud-based productivity or other software loses functionality. This can be a disadvantage in a one-to-one computer program in which some students lack home internet access. But as more software applications move to the cloud, this problem is not limited to Chromebooks or tablets.

As the student-to-computer ratio decreases there is opportunity for districts to explore one-to-one student-to-computer ratios at key grade levels, schoolwide or the entire district. The more exposure students have to computer devices, the more accustomed and proficient they become at using them. With the growing use of computers for high stakes testing, it is essential that students become comfortable using 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 a test of “hunt and peck” skills than a reflection of the student’s ability to respond to a prompt. As the education system continues to move more testing and resources online, districts will need to increase the number of devices they have and expand their internet bandwidth to facilitate these activities.

Educational application providers continue to migrate their products from local school and school district servers to the cloud while virtual classroom portals let students and parents track student assignments and achievement from anywhere. The result of this “move to the internet” emphasizes the need for schools to provide students with a technology device that will extend the classroom into the home.

In considering all of the factors described above, a district that adopts a mix of standard and low-cost units that rely more heavily on lower cost, cloud-based approaches will be able to reduce the average cost of a computer unit. Despite this drop in average cost, the EB Model recommendation remains at $74 per student for computer hardware, recognizing that introducing lower priced units will allow districts to move closer to a one-to-one student-to-computer ratio and improve refresh rates for all units. Variance in the types of computers students use will also better prepare students for the workplace.

In the past, for more expensive computers, the EB Model has recommended that districts purchase 24-hour maintenance plans to eliminate the need for school or district personnel to fix computers. For example, a school or district can purchase a maintenance agreement from a number of computer manufacturers that guarantees computer repair on the next business day. Many private sector companies that offer such service often take a new computer with them, leave it, and take the broken computer to fix. On the other hand, when districts analyze the cost of warranty programs for Chromebooks or similar low-cost hardware, they may find 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 in classrooms or other instructional spaces. Wireless access points within the school site create an instructional environment on campus in which controlled internet access is available anytime or anywhere. 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. The original EB Model recommendation for technology and equipment included modest funds to complete small on-campus infrastructure improvements. It is still unclear whether 5G equipment will be able to be used practically in the school setting unless a broadband access pipe is provided to the school site which can then be redistributed on campus through wireless access points or if it will provide access to students’ homes that were previously in inaccessible areas.

As technology specifications advance, the price of what were premium technological features decreases and the relative price for computer units stays fairly constant. In this process, yesterday’s most advanced feature become today’s common specification. The same is true for network equipment. As network technology improves, price points for many technologies have remained fairly constant even as capacity increases. For example, as the need for bandwidth has jumped, the older network switches with speeds of 100 megabits have been replaced with one gigabit or even 10 gigabit switches that cost the same as a 100-megabit switch years ago. If Vermont funded school-based technology and equipment at $250 per ADM, districts would be able to gradually upgrade necessary network equipment within their campuses and to lower their student-to-computer ratios using a mixture of traditional and new devices.

The 2024 EB Model recommendation for technology remains at $250 per pupil unless Vermont decides to move to a 1-1 ratio. The dilemma is that in a survey of districts, Bushweller (2022) found in 2022 that 90 percent of districts provide computers for every student at the secondary level and 84 percent provide them for each elementary students, largely as a result of equipping students with computers during the pandemic. So, the education system has shifted to a 1-1 computer to student ratio. Still, the research on student impact is inconclusive. Bebell. & O'Dwyer (2010) found that the effectiveness of 1-1 programs depended on whether the initiatives were accompanied by sufficient professional development, which too often was missing. While Zheng, et al., (2016) found in a research review that 1-1 computer ratios produced significant effects in English, writing, math, and science. Using TIMSS data, Karlsson (2020) found that computer use in schools did not positively impact fourth grade school performance. Johnson et al. (2022) found that the online education during the pandemic was too often ineffective. Finally, Goldhaber et al. (2023) found that the more schools used remote and hybrid teaching during the pandemic, the more students fell behind, suggesting that the education system still has work to do to in making 1-1 computer to student ratios lead to higher levels of student learning.

The EB Model does not currently recommend a one-to-one computer to student ratio; we believe such a decision should be a state policy decision, and if a state decided to move in this direction, we would recommend structuring implementation with sufficient ongoing professional development to ensure strong learning gains. In our 2020 Wyoming recalibration report (see www.picusodden.com, State Studies under the Resources section), we estimated that moving to a one-to-one computer system, using mainly Chromebooks, would cost about $350 per pupil. This cost would nearly double if the district used more costly desktop or laptop computers instead.

2024 Evidence-Based Recommendation: Provide $250 per student for a three-to-one computer ratio, but increase it to $350 per student for a one-to-one computer ratio. The decision on one-to-one computing support is, we believe, a policy choice the state would need to make.

18. Extra Duty Funds/Student Activities

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

Participation in Student Activities

A 2009 national survey (Aud, et al., 2012) asked high school seniors about their participation in high school activities including school newspaper, yearbook, music, performing arts, athletics, academic clubs (e.g., world language, science), student government and other school activities. Student respondents indicated 38 percent participated in athletics, followed by other school activities at 32 percent and music and performing arts at 24 percent. Female students participated in other school clubs at a rate of 40 percent, athletics 31 percent and music and performing arts 30 percent. Male students participated in activities as follows: athletics 46 percent, other social clubs 24 percent, music and performing arts 18 percent, and other activities 12 percent. Other than athletics, female students participated in activities at higher rates than male students.

Knop and Siebens (2018) used U.S. Census data to estimate the percentage of children aged 6 to 17 who participated in sports, lessons, and clubs between 1998 and 2014. After 1998, the percentage of children participating in sports was higher than participation in lessons or clubs. An increase in sports involvement occurred between 2011 and 2014, increasing by nearly 7 percentage points from 35 percent to 42 percent. Between 1998 and 2014, participation in clubs declined from 35 percent to 28 percent. Participation in lessons remained about 30 percent over these years. Children in poverty were less likely to participate in these three extracurricular activities.

The Census updated these figures in 2022 (Mayol-Garcia, (2022). Mayol-Garcia shows that the percent of boys and girls participating in sports grew between 1998 and 2020, with a higher percent (44) of boys participating in sports compared to 31 percent of girls. By contrast, the report shows that 29 percent of girls participated in clubs or took lessons in music, dance, etc., compared to just 24 percent of boys. All these percentages dropped for children from lower income families. The report also cites several studies that show, overall, that participation in such non-academic activities is linked to higher academic performance, greater academic aspirations, strong self-esteem and resiliency and lower levels of risky behavior.

<u>Impact of Participation in Student Activities</u>

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 participation in interscholastic (as compared to intramural) sports had a positive impact for both boys and girls on: grades, postsecondary education aspirations, reducing dropout 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 participation in interscholastic athletics places students in new social groups that tend to have higher scholastic aspirations and those aspirations "rubbed off" on all the participants. But the effects differed by race and gender and were not as strong for African Americans.

Fredericks & Eccles (2006) found that secondary students who participated in afterschool activities had higher academic outcomes, increased safety and higher participation in civic activities, and conversely reduced negative behaviors such as use of drugs and alcohol. Other research shows that participation in high school athletics has positive impacts on educational attainment and wages (Barron, Ewing & Waddell, 2000; Eoide & Ronan, 2001; Stevenson, 2010).

In addition, a U.S. Census Report (Knop & Siebens, 2018) found that children tend to have higher levels of school engagement when involved in one or more activities, like sports, lessons or clubs. The report found that 42 percent of children who took lessons (i.e., music, dance, etc.) were highly engaged compared to 33 percent of children who did not. Children in poverty were less likely to participate in each of the three extracurricular activities (sports, lessons and clubs) than those not in poverty, and had less school engagement. Similarly, Crispin (2017) used multiple methods to analyze data from a 1988 longitudinal study and found that for both at-risk and non-at-risk students' participation in extracurricular activities reduced the likelihood of dropping out of high school by 14 to 20 percentage points. In short, the greater the engagement the better students perform in schools and the less they drop out of school.

The positive impact of student activities on student performance are viewed by many as an integral component of a student's education. Across the country schools invest in student activities and students who participate in extracurricular activities from grades 8 to 12, attend college, vote in national and regional elections and volunteer at a higher rate (Zaff, et al., 2003). Despite the many positive impacts on academic achievement of students engaging in extracurricular activities. Balaguer, et al., (2022) caution that the specifics of impact depend on gender, age, duration, and breadth of extracurricular activities. Some activities benefit girls more than boys, some activities have positive impact in early adolescence but negative impacts in later adolescence, etc. The implication is that schools should seek to tailor extracurricular activities to each student individually and not assume a "one size fits all."

During the past several years, the EB Model developed in other states has allocated between $200 and $314 per pupil for student activities, including intramural sports. These figures generally are in line with average amounts spent on such activities in many states (Odden & Picus, 2020). However, our research has not found a common model for allocating state support for student activities.

Thus, in our most recent adequacy study in Wyoming (see www.picusodden.com) we developed sports and activities prototypes for the EB Model 's prototypical 450-student middle school and 600-student high school. The prototypes produced a figure of $600 per pupil for the high school and $322 per pupil for the middle school. Averaging these figures by weighting them for the different numbers of grade levels covered, together with $25 for elementary school, produced an overall figure of $284 per pupil, well within the EB Model 's figure of $300 per pupil (Odden & Picus, 2020). Assuming inflation of 20 percent since 2020, this figure would be $360 today.

2024 Evidence-Based Recommendation: Provide $360 per student for extra duty funds and extracurricular activities.

CENTRAL FUNCTIONS

This section covers two operations usually association with the central office: maintenance and operations, and the central office itself.

19. Operations and Maintenance

Computation of operations and maintenance costs is complicated by the lack of a strong or consistent research base. Some school finance models allocate a percentage of current expenditures to operations and maintenance. The EB Model uses standards to compute the number of personnel needed for custodial, maintenance and grounds workers. Additional funding is provided for utilities.

This section has two parts: one that reviews the literature on the linkage between facilities and student performance and a second focused on professional standards in staffing for operations and maintenance.

<u>Review of Literature on Operations and Maintenance</u>

The research evidence linking the operations and maintenance of schools directly to student performance is both limited and mixed. Even without a strong basis to support the linkage between facility quality and student outcomes, all students are entitled to attend schools in a safe, clean and well-maintained environment. The importance of operating and maintaining this investment is clear regardless of the strength of the relationship between them.

Earthman and Lemasters (1996) reviewed over two hundred studies seeking to find a linkage between the conditions of school facilities and student academic performance. Unfortunately, their review found no consistent connections. Nevertheless, several years later Earthman (2002) underscored the importance of school facility conditions noting at the time that researchers had consistently found a deficit of between 5 and 17 percentile points in student performance in poorly maintained buildings compared to students in standard buildings. The research Earthman cites also suggests via correlational analysis that teacher effectiveness decreases in schools with poor facilities. This led Earthman, who was for many years the leading researcher on school facilities in the United States, to argue not only for the importance of clean, facilities, but also for the importance of quality thermal and acoustic materials in the environment where students learn.

Similar work, completed by The Tennessee Advisory Commission on Intergovernmental Relations (Young, et. al., 2003), showed a statistically significant relationship between the condition of a school or classroom and student achievement. Students attending schools in up-to-date facilities scored higher on standardized tests than those in substandard buildings. The committee concluded that policy makers should consider the relationship between school facilities and student learning outcomes, not only because of safety and welfare responsibilities to the students and staff, but also because a lack of adequate funding for facilities repair and maintenance can undermine spending in other areas focused on educational reform.

Young, et. al. showed positive educational outcomes were correlated with the following factors:

- New facilities
- Well-maintained buildings
- Thermal regulations to avoid excessive temperatures
- Appropriate lighting levels
- Utilizing relaxing shades of paint, and
- Limited external noise.

Contrary to this, Picus, Marion, Calvo and Glenn (2005) studied the correlation between the quality of Wyoming school facilities and student outcomes. School quality was measured with a 100-point scale developed specifically for Wyoming schools and used to assess every school. These scores were correlated with measures of student outcome controlling for student characteristics, and no statistically significant relationship was found. Similarly, Brooks and Weiler (2018) in a specific study in Colorado found little or no link between facilities conditions as determined by a Colorado School Facilities Index and student scores on Colorado summative state tests. Although these findings do not mean a state should abandon its efforts to provide safe, clean and well-maintained facilities, expectations that student performance will improve with better facilities should be moderated.

Whatever research concludes on the link between facilities and student performance, students and educators deserve adequate, clean, and well-maintained buildings. The challenge is how to provide such resources. The EB Model uses professional standards to address this challenge.

<u>Professional standards for operations and maintenance staff</u>

Drawing on professional standards in the field, we have developed a cost basis for staffing maintenance and operations (Odden & Picus, 2020). The discussion below uses these standards to identify the needs for custodians (school level), maintenance staff (district level) and groundskeepers (school and district level), as well as the costs of materials, supplies and utilities to support these activities.

<u>Custodians</u>

Custodians are responsible for the cleanliness of school 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 replacing light bulbs, and are expected to clean restrooms, cafeterias/multipurpose rooms, lockers and showers. Custodial workers' duties are time-sensitive, structured, and varied. Many schools see custodians as a front-line employee who often interact with teachers and students daily. Custodians are also often responsible for ensuring that major mechanical equipment within the facility is running well and identifying appropriate services to make repairs when needed.

Zureich (1998) developed the standards to estimate custodial needs at the school level. Zureich's standards were updated by Nelli (2006) as part of a Wyoming adequacy study. The standards include the number of teachers, students, classrooms and gross square feet (GSF) in the school:

- One custodian for every 13 teachers, plus
- One custodian for every 325 students, plus
- One custodian for every 13 classrooms, plus
- One custodian for every 18,000 allowable GSF, and
- The total divided by four to calculate a base FTE school level custodian position.

This base FTE position is further adjusted by an additional 0.5 FTE for secondary schools. Custodian positions for non-educational buildings are based solely on gross square footage (GSF).

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

Recently we found three other standards for determining custodians for school buildings:

1. A public formula used in Pennsylvania (Pennsylvania Association of School Business Officials (PASBO)
2. A private sector formula used by Aramark and other private providers of cleaning for schools, and
3. A public formula used by Florida to suggest M & O staffing for schools.

In order to compare the four different approaches, we used a simulation for the generic EB Model that comprises a 3,900-student prototypical school district, with four 450-student elementary schools, two 450-student middle schools and two 600-student high schools. The EB Model yields a total of 23.3 custodians for this prototype.

The Pennsylvania formula for staffing custodians uses the same four factors as the EB Model – number of teachers, students, classrooms and GSF as well as the additional factor of the number of washroom fixtures (sinks, urinals, toilets) – but has different benchmarks for each of these five elements. Pennsylvania's model is as follows:

- 1 custodian for every 9 teachers
- I custodian for every 300 elementary/200 secondary students
- 1 custodian for every 12 classrooms
- 1 custodian for every 16,000 Gross Square Feet (GSF)
- 1 custodian for every 35 washroom fixtures (sinks, urinals, toilets)
- All the above summed and divided by 5.

The Pennsylvania model yields a total of 27.3 custodians for the EB prototypical district or four additional custodians.

The private sector model employs a simpler formula for cleaning, using only Gross Square Footage (GSF) of the building. It then takes 80 percent of the GSF as Cleanable Square Footage (CSF) and provides one custodian position for every 22,000 CSF for elementary schools and one custodian position for every 28,000 CSF for secondary schools. The private sector model yields just short of 20 custodians for the EB prototypical model, about 3.3 fewer custodians than the EB Model and 7.3 fewer than the Pennsylvania model.

The Florida model is similar to the private sector model but uses 19,000 CSF instead of 22,000 CSF. This would allow for more custodians than the private sector model but fewer than the Pennsylvania model putting it very close to the current EB Model. The Florida model would produce 25.8 custodians, 2.5 more than the current EB Model.

All four models are relatively close in their calculation of custodial staffing. The Pennsylvania model, though, assumes a higher level of cleanliness that is often associated with hospitals and nursing homes. The private sector model assumes that cleaning is largely a nighttime function provided by part time workers. Schools, however, need custodial support during the day so the leaner private sector model would place at most one custodian at the school during the day. The Florida model produces somewhat more custodians. We conclude that the current EB Model, which provides a level of custodial staff in between these three alternative standards, is the most appropriate choice for staffing custodians for the education sector.

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 (Zureich, 1998):

- HVAC systems, HVAC equipment, and kitchen equipment
- Electrical systems, electrical equipment
- Plumbing systems, plumbing equipment, and
- Structural work, carpentry and general maintenance/repairs of buildings and equipment.

Zureich's standards for maintenance workers for instructional facilities as follows:

- Calculated on the basis of four factors:
    - An initial 1.10 maintenance worker FTE, plus
    - One maintenance worker for every 60,000 allowable educational GSF at factor of 1.2, plus
    - One maintenance worker for every 1,000 School ADM at factor of 1.3, plus
    - One maintenance worker for every $5 million of general fund operating expenditures from SY 2004-05 at a factor of 1.2.

- These four FTE factors are added together and divided by four to arrive at a base maintenance worker FTE.
- The base FTE is further adjusted for:
    - School level (base FTE is multiplied by 0.80 for elementary schools, 1.0 for middle schools, and 2.0 for high schools)
    - Building age, where schools under 10 years old are multiplied by a factor of 0.95 and over 30 years old by a factor of 1.10, and
    - Small district size where the base FTE is multiplied by a factor of 1.10 for districts with ADM under 1,000.

The current EB Model eliminates the general fund operating expenditure factor. The size of school district general fund budgets has increased considerably over the past 15 years since this formula was developed, and we have been unable to identify an empirical basis for an alternative number. The impact of eliminating this computation produced a modestly higher number of maintenance workers in a recent state adequacy study; it provides modestly fewer worker for the prototypical district. We also assume that the maintenance worker FTEs determined based on a district's total allowable educational GSF for schools are sufficient to service all buildings in a district, both educational and non-educational.

Florida has a simpler formula to determine the number of maintenance workers:

- One Maintenance FTE for every 45,000 sq. ft
- One Support FTE for every six maintenance workers.

The current EB Model formula produces 9.88 maintenance staff in a prototypical school district of 3,900 students while the Florida formula produces 13.8 maintenance staff plus 2.3 support staff to support the maintenance workers – this amounts to 3.9 more maintenance workers and 2.3 more support staff.

The current EB Model uses a standard recommended by Zureich (1998). In our search for how other states provided for maintenance workers, we could not find any state, except Florida, that either directly used a standard for maintenance worker staffing or suggested a standard. Most states simply do not reach this level of detail in their school funding models.

Unlike custodians, there is some uncertainty in projecting staffing loads and maintenance costs without assessing the individual needs of each district and its composite buildings. For example, one district that has a centralized HVAC control system might be able to monitor and project motor or condenser failures well in advance and thus hold down costs, while this possibility is not available to another district that does not have a centralized HVAC monitoring system. Private sector companies that provide services in this area use sophisticated software that calculates staffing needs and costs based on the individual inventory of the district.

<u>Groundskeeper Positions</u>

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. Groundskeepers are determined at the site rather than building/program level. The number of groundskeepers for all sites, both educational and non-educational, is based on the following:

- The number of acres of the site and the standard for the number of annual work hours per acre (93 hours). The FTE calculation assumes a 2,008-hour work year for groundskeepers.
- The initial FTE is adjusted for the primary school level or use of the site, with non-educational and elementary school sites receiving no additional adjustment, middle school sites receiving an adjustment factor of 1.5 and high school sites an adjustment factor of 2.5

Florida has a suggested staffing formula for groundskeeper positions for schools, that is simpler than the EB Model:

- Total acreage divided by 40
- Add one FTE
- Plus, one FTE per 500,000 gross square feet (GSF) of athletic fields.

This formula produces more groundskeeper positions than the EB Model, but we see no compelling rationale to adopt it for Vermont.

Supplies/Materials and Utilities

We have increased the figure for operation and maintenance supplies and materials to $1.00 per GSF and estimate $350 per pupil for utilities. The latter is an estimate that should be addressed in more detail by a cost factor study as utility costs vary substantially across Vermont's districts.

20. Central Office Staffing/Non-Personnel Resources

All districts require central office staff to meet the overall management needs of their educational programs. School district central office administrators exercise essential leadership, in partnership with school-site leaders, to build capacity throughout public educational systems for teaching and learning improvements (Honig, et al., 2010). Central Office functions include the overall management of all aspects of a school district regardless of enrollment size including fiscal management (including budgeting, accounting and enrollment and fiscal projections), supervision of teaching and learning, human resources, legal matters and communications. Central Office functions require both certificated and non-certificated personnel.

As described in Chapter 2, the EB Model uses a theory of action about successful schools and districts – that is districts providing all students with an equal opportunity to meet their state's performance standards – and describes our research-based estimates of an adequate level of resources to provide that level of schooling. To facilitate the analysis and description of the EB Model, we rely on prototypical schools and districts to help estimate the cost of an adequate level of resources in a given state. While we realize there are likely few if any schools or districts that have these exact combinations of schools and students, the prototypical school enables us to develop resource estimates and the prorate (using a variety of algorithms) actual resources and associated costs to schools and districts.

The prototypical school district we use for the EB Model has a total of 3,900 students located in eight schools. There are four elementary schools of 450 students, two middle schools with 450 students and two 600 student high schools. The logic behind this relates to the core class sizes in the EB Model of 15 in grades K-3 and 25 in grades 4-12. A prototypical 450 student elementary school with 75 students in each of six grades (K-5) has five classrooms of 15 students each in grades K-3 (300 students) and three classrooms of 25 students each in grades 4 and 5 (150 students). A prototypical middle school has three grades (6-8) of 150 students each for a total of 450 students and a prototypical high school has four grades (9-12) of 150 students each for a total of 600 students. Thus, a prototypical district has 3,900 students – 1,800 elementary, 900 middle and 1,200 high school.

These numbers may seem small or low to some, particularly readers living in large urban school districts, but on a national basis, the National Center for Education statistics estimates the average school district had 3,713 students in Fall 2016. That same year the average elementary school had 481 students and the average secondary school 488 students (NCES, 2018). At the same time, these figures might seem large to some small districts and schools in Vermont. But we have used these prototypes in many states with both smaller and larger schools and districts.

Over the past 20 years, we have developed central office staffing recommendations in states where we have conducted adequacy studies. Initially, we began with the research of Elizabeth Swift (2005), whose Ed.D dissertation at USC relied on professional judgment panels to estimate adequate central office staffing for a prototypical school district. That research addressed the issue of the appropriate staffing for a district of 3,500 students. Swift's work formed the basis of our early state analyses. We conducted further professional judgment panels in several adequacy studies (North Dakota, Washington, Wisconsin, and Wyoming) to review the basic recommendations that emerged from Swift's research. Through that work we were able to estimate the central office resources required for a district of 3,500 students. The initial studies estimated a need for about 8 professional staff (superintendent, assistant superintendent for curriculum, business manager, and directors of human resources, pupil services, technology, and special education) and nine clerical staff positions.

Beyond the Swift study and our Professional Judgment panels, the research basis for staffing school district central offices is relatively limited. Analysis of the 2009 Educational Research Service Staffing Ratio report showed that nationally, school districts with between 2,500 and 9,999 students employed an average of one central office professional/administrative staff member for every 440 students (Educational Research Services, 2009). This equates to about eight central office professionals (7.95) in a district of 3,500 students, effectively matching our research-based staffing formula of eight FTE professional staff.

Over time, we realized that the 3,500-student district size we used for estimating central office staff did not readily incorporate the EB Model 's prototypical school and school district size we had developed. Consequently, we modified our central office staffing estimates to use a district size of 3,900 students with eight schools as described above.

This larger size allowed the addition of testing and evaluation, and computer staff to our central office staffing estimates. This is supported by current operations of school districts and the professional judgment panel recommendations we have generated from a number of states in more recent years. Panels in states as diverse as Vermont, Maryland, Michigan, and Wyoming have described the importance of these personnel.

Testing and evaluation staff are critical given the growing use of standardized testing throughout education. As a result, we added a director of assessment and evaluation to our recommended central office staff. Technical staff to support technology is also critical today. To meet the needs of schools for both educational and administrative computing, we have added school computer technicians, i.e., individuals who install computers and software, maintain wired and wireless connections, keep computers and printers operating and stocked with supplies. Although primarily serving school sites, these positions would be staffed through the central office so they could be dispatched to meet the greatest need at any specific time. Given the increased use of computers, the model now includes four school computer technicians in the prototypical central office. Central office staffing for a prototypical district of 3,900 students today includes a director of technology, a network supervisor, a software supervisor and four school computer technicians (see Table 3.2).

2024 Evidence-Based Recommendation: Central Office Personnel:8.0 professional and 17.0 classified positions. Non-Personnel Resources: $450 per ADM for non-personnel resources.

Table 3.2: EB Central Office Staffing for a District with 3,900 Students

Office and Position	FTE	
	Admin	Classified
Superintendent	1	
Secretary		1
Business Manager	1	
Director of Human Resources	1	
Accounting Clerk		2
Accounts Payable		2
Secretary		1
Assistant Supt. for Instruction	1	
Director of Pupil Services	1	
Dir. of Assessment and Evaluation	1	
Secretary		3
Director of Technology	1	
Network Supervisor		1

Office and Position	FTE	
	Admin	Classified
(Hardware)		
Systems Supervisor (Software)		1
School Computer Technician		4
Secretary		1
Director of O&M	1	
Secretary		1
Central Office Staffing	**8**	**17**

RESOURCES FOR STRUGGLING STUDENTS

The staffing for core programs section contains positions for supporting teachers and students beyond the regular classroom teacher. Those positions include elective or specialist teachers, core tutors, instructional facilitators, substitute teachers, core guidance counselors, nurses, supervisory aides, librarians, library aides, school computer technicians, school administrators and school secretarial and clerical staff.

In many instances, even more additional support is needed for struggling students. The resources 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 to give all students multiple opportunities to achieve to proficiency levels. The EB Model elements for extra help are also embedded in the RTI schema described at the beginning of this chapter.

It is important to note that the EB Model uses two student counts to trigger extra help resources: ELL students and non-ELL poverty students (the latter usually being the number of students eligible for free and reduced-price lunch). The goal is to ensure that the unduplicated count of both ELL and poverty students serves as proxies to trigger these additional resources.[23]

The EB Model provides substantial additional resources for struggling students, as indicated by these two pupil counts: tutors, pupil support, summer school and extended day programs, additional teaching staff for ELL students and staff for alternative learning environment schools. These resources for struggling students should be viewed in concert with resources for students with identified disabilities. Districts sometimes over identify students for special education services as the “only” way to trigger more resources for some struggling students. The EB Model ’s goal in providing a robust set of resources for struggling students, whether or not they have been identified as a student with a disability, is to provide adequate resources for all struggling students, with or without a diagnosed disability, and to reduce over time any over identification of students with disabilities.

This section includes discussion of seven categories of services: additional tutors, additional pupil support, extended day programs, summer school programs, ELL teachers, special education, Career Technical Education (CTE) and alternative schools.

21. Tutors

The first strategy to help struggling students is to provide tutoring support as described in Element 6 above. In addition to the one core tutor position provided to every prototypical school discussed above for Element 6, the EB Model provides additional tutor/Tier 2 interventionist positions at the rate of one for every 100 ELL and non-ELL poverty students.

Section 6 above provided the general evidence for tutors as a very effective strategy for helping struggling students to achieve to higher performance standards. And although the bulk of the

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[23] A state could also use all poverty students and all non-poverty ELL students. The goal is to provide the extra resources for an unduplicated count of all ELL and poverty students.

evidence addressed one-to-one tutoring, the section also addressed research on small group tutoring, up to groups of 5 students. However, most research on tutoring was conducted prior to the COVID 19 pandemic, which produced dramatic learning loss across many subjects and many students in the country. This reality in part led some analysts to identify and then conduct research on the impacts of a new form of tutoring, called High Dosage Tutoring or HDT.

HDT uses one person to tutor one, two or up to four students at a time for a full period a day five days a week. This is substantially more time than the traditional 20-30 minutes of tutoring often studied by other research. Brown University Professor Matthew Kraft and the late Johns Hopkins University Professor Bob Slavin recommended the development of a national effort of "high dosage tutoring" as the strategy to reverse the learning loss caused by COVID (see also Barshay, 2020). Rather than a licensed teacher, HDT is usually provided by a recent college graduate who has been trained in a specific math or reading tutoring program, or other content area (e.g., science) linked to the school's curriculum. The tutors are not volunteers, nor traditional paraprofessionals, but full-time school employees who have earned a bachelor's degree in a content area and are typically paid at a rate between an instructional aide and a new teacher. Kraft and Falken (2021) outline how the country could scale up a HDT program, and the concepts and ideas put forth could also be adopted by a state, such as Vermont.

Research suggests this HDT approach has larger effect sizes than found in the studies of more traditional tutoring programs described above (see Baye et al., 2019; Cook et al., 2015; Freyer, 2016; Fryer & Noveck, 2017). Guryan, et al.'s (2021) randomized controlled trial research showed that HDT positively impacts adolescents as well as elementary students, thus arguing that HDT is an effective, and cost-effective K-12 strategy for improving academic outcomes for students. Robinson & Loeb (2021) provide additional research on the significant, positive effects of HDT and outline more detail on how such programs should be structured at the school level. In sum, creating a corps of HDT tutors could be one powerful strategy for making up for the loss of learning caused by COVID-19, or any other reasons, and could be funded by the tutoring resources included in the EB Model. HDT tutors hopefully could boost achievement by significant amounts for any group of students achieving below expectations and is a tutoring strategy Vermont should seriously consider.

Cortes, Loeb and Robinson (2024) document the impressive results of a scalable, high dosage tutoring program for reading in elementary schools. And the Illinois Tutoring Initiative (2024) found that students who received tutoring made significantly larger gains in reading and mathematics during the 2022-23 than those who did not receive tutoring. Importantly, the evaluation also found that students with disabilities and ELL students who experienced tutoring produced even larger gains in reading and math scores, on both the Illinois state test and local assessments.

2024 Evidence-Based Recommendation: Provide one teacher tutor/Tier 2 interventionist position for every 100 ELL and non-ELL poverty students. Note that the EB Model allocates these additional tutor positions above the core tutor positions generated at each prototypical school and described in element six above.

22. Additional Pupil Support

Core pupil support positions for school counselors and nurses are discussed in Element 8. At-risk students, however, generally have more non-academic needs that must be addressed by additional pupil support staff, which include additional school counselors, as well as social workers, family liaison staff, and psychologists. Students social and emotional conditions worsened during the pandemic further supporting the need for those services in many schools. Complementing the core school counselor and nurse positions, the EB Model provides additional pupil support positions at the rate of one position for every 100 at-risk students – non-ELL poverty and all ELL students.

ELL students and students from low-income backgrounds, and many other students traumatized by the COVID pandemic, tend to have a multiplicity of non-academic needs that schools should address. This usually requires interactions with families and parents as well as more counseling in school. The greater the concentration of at-risk students, the more intensive these family and student outreach efforts need to be. The EB Model addresses this by providing additional pupil support staffing resources based on the counts of ELL and non-ELL poverty student counts.

Various comprehensive school designs have suggested different ways to provide more intensive family and student outreach programs (Stringfield, Ross, & Smith, 1996; for further discussion, see Brabeck, Walsh, & Latta, 2003). In terms of level of resources, the more disadvantaged the student body, the more comprehensive the strategy needs to be.

Although there are many ways schools can provide outreach to parents or involve parents in school activities – from fund raisers to governance – research shows school sponsored programs that have an impact on achievement address what parents can do at home to help their children learn. For example, parent outreach that explicitly and directly addresses what parents can do to help their children be successful in school, 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 course taking and academic performance. If a district or a state requires a minimum number of courses for graduation, those requirements should be made clear. If either an average score on an end-of-course examination 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 to identify an academic pathway through middle and high school, understand standards for acceptable performance, and be aware of the course work necessary for high school graduation and 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 about the requirements for transition from high school to postsecondary 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 parent-teacher organizations, 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 student learning would include: 1) reading to them at young ages, 2) discussing stories and their meanings, 3) engaging in conversations with open ended questions, 4) setting aside a place where homework can be done, and 5) ensuring that their child completes all homework. Recent research shows that *texting* these ideas to parents can result in improved student performance (Smith, 2021).

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 Program and the Comer School Development Program. The Success for All Program includes a family outreach coordinator, a nurse, a social worker, a counselor and an education diagnostician for a school of about 500 students. 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 all students, especially in cold climates, have sufficient and adequate clothes, and coats, to attend school.

The Comer School Development 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 to work with the school's faculty to raise their expectations for what students can learn. Sometimes the team co-locates on school site premises to provide a host of social services. The need for robust family outreach programs and the efficacy of the Comer designed School Development Program today was reinforced by Linda Darling Hammond and colleagues (2019) who argued that the program is as relevant in current times as when it was created in the late 1990s.

A program called Communities in Schools (www.communitiesinschools.org), which now operates in 26 states and the District of Columbia and can be resourced by the additional staffing provided by this element, has been successful in raising school attendance rates as students need to attend school in order to learn. The program adds a caseworker, often trained in social work, to a school's pupil support team to help match social services provided by non-educational agencies to students who need them. KIPP Charter schools also have robust parent involvement strategies, which also can be supported by these extra pupil support resources.

These additional pupil support staff can also be used to provide some of the mental health services educators in several states increasingly argue many students need. At the Professional Judgment Panels we conducted over the past several years in Maryland, Michigan, Vermont and Wyoming, one of the overwhelming findings has been the increasing need for staff to meet the social and emotional needs of students and their families. The COVID-19 pandemic and the changes required to maintain personal physical and mental health further increased the need for school staff to help students and their families cope with a wide range of challenges, including mental health challenges. Levenson (2017) identifies ten best practices schools can deploy to provide a range of social and emotional supports for students, all of which can be provided by the pupil support resources provided by the EB Model, both the core pupil support resources and the additional resources provided by at-risk pupil counts.

2024 Evidence-Based Recommendation: Provide 1.0 additional pupil support position for every 100 ELL and every 100 non-ELL poverty students. Note that the EB Model allocates these additional tutor positions above the core pupil support positions generated at each prototypical school and described in element eight above.

23. 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 they receive tutoring or other kinds of Tier 2 interventions during the regular school day.

Extended-day programs provide environments for children and adolescents to spend time in school *after* the regular school day ends, but during the *regular school year*. Reviews of research found that well designed and administered after-school programs yield numerous improvements in academic and behavioral outcomes (Fashola, 1998; Posner & Vandell, 1994; Vandell, Pierce & Dadisman, 2005).

On the other hand, the evaluation of the 21st Century Community Learning Centers 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 (e.g., Vandell, Pierce & Dadisman, 2005) argued the control groups had higher pre-existing achievement, which reduced the potential for finding program impact. Critics also argued the small impacts identified had more to do with the lack of full program implementation during the initial years than with the strength of the program. However, subsequent analyses of the 21st Century learning centers found, over a 15-year period, significant, positive impacts on student academic performance (Peterson, 2013; Weiss, 2013).

Studies of two statewide programs, one in Massachusetts and the other in Florida, found extended day programs had modest or no significant effects on student academic programs (Checkoway, et al, 2013; Folsom, et al., 2017). But, Auger, Pierce & Vandell (2013) found that participation matters, and that low-income students who participated consistently in an after school elementary program caught up to other students in 5th grade mathematics. Kraft (2015) describes how individual tutoring programs in extended day programs can have significant impacts on student learning. In a review of the effect of extended day programs, McCombs et al., (2017) further support the efficacy of after school programs as well as the key structural elements discussed below. The study concluded that academically oriented after school programs positively impact student performance in the subjects addressed. Vandell et al. (2022) found that students participating in high quality after school programs combined with participation in extracurricular activities were reported by teachers have higher academic performance, work habits, and task persistence, and less aggression. In sum, multiple studies and more research reviews have documented positive effects of extended-day programs on the academic performance as well as behavioral outcomes of students who participated in select after-school programs (e.g., Vandell et al., 2020; Wu, 2020). Both program quality (e.g., teacher qualifications) and student attendance impact results – students who regularly attend academically oriented after school programs experience the largest positive academic results.

Further, guidance from the U.S. Department of Education for evidence-based uses of ESSER III funds identify structured after school programs, like those that have the features identified below, as one such program. In a related handbook, Peterson and Vandell (2021) further review the substantial evidence of the impact of after school programs on student academic learning and identify the structural features of the afterschool programs that work. Those structural features are very similar to those the EB Model has identified for several years. These conclusions and recommendations further support the EB Model 's after school resources.

After school, extended day programs can help improve student learning but it depends on multiple features of the programs, and the participation behaviors of students. In practical terms, program evaluators 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).
- A program *culture of mastery*, i.e., engaging in activities to become more proficient and/or to meet various standards of performance.
- 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 EB Model includes resources for an extended-day program for all school prototypes that meets these structural supports. The resources can be used to provide students in all elementary and all secondary grades with additional help during the school year, but *after* the normal school day, to meet academic performance standards.

Because not all at-risk students will need or will attend an after-school program, the EB Model provides extended day resources for half of the at-risk students in a school. This reflects a need and participation rate identified by Kleiner, Nolin, and Chapman (2004). More recent data generally confirm the assumption that not all students who need an after-school program will attend one. NCES (2023) found that 64 percent of schools across the country provided after school programs with an academic emphasis. Licensed teachers tended to work in the programs.

The study also found, however, that only about 22 percent of students eligible for the programs participated in them, although the study did find that the participation rate was slightly higher for students in urban schools serving students of color.

The EB Model assumes that each extended day teacher serves 15 at-risk students each day for two hours and is paid an additional 25 percent of salary to meet with those students. The EB Model also assumes half of the at-risk students will participate in the program, so a school with 120 at-risk students will receive funding for four individuals to serve 60 students in groups of 15 for two hours (25 percent FTE) a day. Simplified, the formula equates to one teacher position for every 120 at-risk students.

2024 Evidence-Based Recommendation: Provide 1.0 extended-day teacher position for every 120 ELL and every 120 non-ELL poverty students. Provide more resources as student participation in after school programs increases.

24. Summer School Programs

Many students need extra instructional time outside of the regular school year to achieve the state's proficiency standards. Summer school programs should be part of the range 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). It should be noted summer school services are provided outside of the regular school year.

Evidence dating back to 1906 shows 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 low-income 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 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).

Evidence on the effectiveness of summer programs in attaining either of these goals was mixed in earlier research. Although past research linking student achievement to summer programs showed some promise, several studies suffered 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 the average student in summer programs outperformed about 56 to 60 percent of similar students not receiving the programs. However, the certainty of these conclusions was compromised because only a small number of studies (e.g., Borman, Rachuba, Hewes, Boulay & Kaplan, 2001) used random assignment, and program quality varied substantially. A more recent meta-analysis of summer programs that specifically addressed math achievement found positive impacts on student performance (Kraft, et al., 2021).

Randomized controlled trial research of summer school reached more positive conclusions about how summer programs can positively impact student learning (Borman & Dowling, 2006; Borman, Goetz & Dowling, 2009). 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. A 2016 randomized control trial of summer school, found that summer programs that focused on academics, provided small classes of 15, and lasted for several weeks, produced significant positive impacts on elementary student academic achievement (Augustine, et al., 2016). Not surprisingly, the study found that students who attended these summer programs for longer times experienced larger gains in reading and math scores than students who attended for less than four weeks.

Browne (2019) found that voluntary summer school programs in five large districts, with class sizes of 15 and that provided both academics and enrichment, increased student test scores the next year 20-25 percent of the typical annual gain for frequent attenders but smaller gains for those students who were not frequent attenders. About 60 percent of program participants were frequent attenders. One implication, clearly, is to enhance strategies to get more students to attend summer school more often.

Researchers (see Browne, 2016-17; McCombs, et al., 2011; Pitcock & Seidel, 2015.) noted 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
- 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. A 2013 review of the effects of summer school programs reached this same conclusion (Kim & Quinn, 2013). Kim and Quinn’s meta-analysis of 41 school- and home-based summer school programs found students in kindergarten through grade 8 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. Borman et al. (2020) found similar significant impacts on student’s reading performance, for a replicable summer reading program, Kids Read Now, with the effect size rising to 0.19 for students who read the most books over the summer.

A comprehensive book on the "summer slide," written by several of the analysts cited above, expands on these points (Alexander, Pitcock & Boulay, 2016). The book describes what is known about learning loss over the summer and what can be done to prevent it. The authors' suggestions for how to structure effective summer school programs echo the recommendations above.[24]

Callen et al., (2023) studied the impact of summer programs in several school districts that were created as a strategy to improve learning loss caused by the COVID pandemic. The findings were modest: small impacts on mathematics performance but no impact on reading. However, the study included students who attended for just one day as well as those who attended for the entire summer school period; clearly, those who barely attended would be unlikely to have improved math or reading achievement. The programs themselves also varied, from providing only a small amount of academic instruction to providing several hours a day of academic instruction. Students who received little academic instruction, even with high attendance, would not likely improve achievement scores substantially. In other words, the study did not assess the impact of structured summer school programs in the districts. The study could more appropriately be termed a study of "natural variation" in summer school experiences, and "natural variation" studies usually produce modest if any positive results. The findings from this study should not be interpreted to mean summer school programs do not work, but rather, to work, summer school programs need the core elements discussed above: a 6–8-week program, several hours a day of academic instruction, and high student attendance.

In 2018, the National Academy of Sciences convened a panel of top experts to review the evidence of the impacts of summer experiences on child and adolescent development (National Academy of Sciences, 2019). Their first conclusion was quite definitive: summer experiences, appropriately designed, have significant effects on cognitive, social, and physical development. The second conclusion was that summer experiences were unequally distributed and that children from low-income backgrounds were most in need of such experiences. Further, guidance from the U.S. Department of Education for evidence-based uses of ESSER III funds identify summer school programs, like those that have the features identified above, as one such program. In a related handbook, Peterson and Vandell (2021) further reviewed the substantial evidence of the impact of summer school programs on student academic learning and identified the structural features of the summer school programs that work; and those structural features are very similar to those the EB Model has identified for several years. These conclusions and recommendations further support the EB Model 's summer school resources.

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 students in all grades K-12. This reflects a need and participation rate identified by (Capizzano, Adelman & Stagner, 2002).

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[24] Lynch and Kim (2017) report that a randomized controlled trial of an *on-line* summer school program for mathematics had no impact on student learning but could not determine whether it was the on-line curriculum itself, or some other programmatic element – like monitoring of students engaging in the online instruction – that diminished the impact.

More recent data generally confirm the assumption that not all students who need a school program will attend them. NCES (2023) found that 78 percent of schools across the country provided summer school programs with an academic emphasis in summer 2023. Licensed teachers tended to work in the programs. The study also found that only about 19 percent of students who had the opportunity to attend the programs did so, although the participation rate was slightly higher for students in urban schools serving students of color.

The EB Model provides resources for a program of eight weeks in length with a six-hour day. This allows for at least four hours of instruction in core subjects. A six-hour day also allows for up to two hours of non-academic activities each day. The formula for staffing summer school programs equates to one teacher position serving 15 students and paid at 25 percent of annual salary or 4.0 FTE teachers per 120 at risk students (recall that only half or 60 of the 120 students are estimated to enroll in summer school). This position is paid at the rate of 25 percent of the annual teacher salary. Simplified, the formula equates to one full time teacher position for every 120 at-risk – ELL and non-ELL poverty – students.

As the discussion to this point shows, the EB Model ’s resources for at-risk students are a sequenced set of connected and structured programs that begin in the early elementary grades and continue through the upper elementary, middle, and high school levels. The EB Model provides resources so that the most academically deficient at-risk students receive Tier 2 interventions that include tutoring, an extended-day program with an academic focus, and a summer school program that is structured and focused on academics. ELL students receive all of these services *as well as* the additional ELL resources discussed in the next section. Further, these additional instructional resources are supplemented by additional pupil support staff as well (Element 22).

2024 Evidence-Based Recommendation: Provide 1.0 summer school teacher position for every 120 ELL and every 120 non-ELL poverty students.

25. English Language Learner (ELL) Students

Research, best practices and experience show that ELL students need additional assistance to learn English, as well as content and content-related language in regular content classes. This can include some combination of small classes, Sheltered English for content 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.

The EB Model provides resources for ESL teachers in addition to the at-risk resources for tutors, pupil support, extended day, and summer school for all ELL students. Specifically, the EB Model provides one teacher position for every 100 ELL students for tutoring, one teacher position for every 100 ELL students for extra pupil support, one teacher position for every 120 ELL students for summer school, one teacher position for every 120 ELL students for extended day programming, ***and in addition***, one teacher position for every 100 ELL students for additional language support. This represents a robust set of additional resources beyond core staff for ELL students.

Good ELL programs work, whether the approach is structured English immersion (Clark, 2009) or initial instruction in the native language, often called bilingual education. Bilingual programs have been studied intensively. A best-evidence synthesis of 17 studies of bilingual education (Slavin & Cheung, 2005) found 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 2011 randomized controlled trial also produced strong positive effects for bilingual education programs (Slavin, et al., 2011), but concluded the language of instruction was less important than the approaches taken to teach reading.

Addressing the important issue of learning to read in *The Elementary School Journal*, Gerstein (2006) concludes 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, in other words, follows the current science of reading instruction discussed in Element 15. Gerstein's studies also showed ELL students benefit from instructional interventions initially designed for monolingual English-speaking students, the resources for which are included in the four at-risk student triggered programs: tutoring, extended-day, summer school and pupil support.

Bilingual education is difficult to provide in most schools today because students come from multiple language backgrounds, and it is difficult to find teachers who are fluent in the many languages represented by small groups of students. And even if teachers could be found with such language proficiency, it would be impossible to use a bilingual approach if there were multiple non-English languages spoken by students in the class. Consequently, many schools have adopted the Sheltered English approach, and the EB Model argues that all schools with ELL students should adopt the Sheltered English approach. Thus, the EB Model uses the Sheltered English model for estimating ELL resources in schools. Brown University's Education Alliance Project defines sheltered instruction as an approach to teaching English language learners that integrates language and content instruction. Sheltered instruction has two prime goals: 1) to provide access to mainstream, grade-level content, and 2) to promote the development of English language proficiency, including the academic language specific to the content area (The Education Alliance, 2020).

One specific sheltered English approach is the Sheltered Instruction Observation Protocol (SIOP) Model. SIOP is a research-based and validated instructional model that has proven effective in addressing the academic needs of English learners throughout the United States. The SIOP Model consists of eight interrelated components: lesson preparation, interaction, building background, practice and application, comprehensive input, lesson delivery, strategies and review and assessment (see Echevarria, Vogt, & Short, 2017 for more detail). Three studies by Short, Echevarria, and Richards-Tutor (2011) found that students with teachers who were trained in the SIOP Model of sheltered instruction and implemented it *with fidelity* performed significantly better on assessments of academic language and literacy than students with teachers who were not trained in the model, underscoring the importance of professional development in implementing this instructional approach. Further, Le and Polikoff (2020) found that schools that adopted specific English language development curriculum produced larger impacts on students' English proficiency, suggesting that English language development needs to be a structured and systemic aspect of instruction for ELL students.

In focus groups we conducted as part of EB studies in several states, many educators also argued that sheltered instruction represents high-quality and effective instruction and is effective not only for ELL students but also all students, and particularly non-ELL, at-risk students (e.g., Odden & Picus, 2018). This suggests developing Sheltered English instruction for all teachers can have the side benefit of improving the performance of all students, not just ELL students.

For Sheltered English instruction, districts and schools of education should provide professional development and training for the pedagogical skills needed by teachers to implement this approach. The EB Model has recommended the Sheltered English approach for over a decade and includes substantial professional development resources.

Providing a classroom aide that speaks some of the languages of the ELL students does not result in improved student performance. And co-teaching classes with ELL students is not cost-based. Sheltered English programs, by being cost-based, supersede the practice in many districts of having two teachers provide instruction to a class of ELL students – one content knowledgeable teacher speaking English, and a second teacher who has expertise in the second language represented in the classroom, but often does not know the content. Co-teaching, moreover, is twice as expensive as Sheltered English Instruction and, even if it were effective, would not be cost-based because of its high cost (District Management Group, 2020).

Beyond the most cost-effective general structure for providing instruction to ELL students, however, research shows ELL students need a solid and rigorous core curriculum as the foundation on which to provide both core instruction and any extra services (Gandara & Rumberger, 2008; Gandara, Rumberger, Maxwell-Jolly, & Callahan, 2003). This research suggests ELL students need (and the EB Model provides):

- Effective teachers – a core goal of all the staffing in the EB Model.
- Adequate instructional materials and good school conditions.
- Good assessments of ELL students so teachers know in detail their English language reading and other academic skills.
- 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, and
- Professional development for all teachers, focused on sheltered English teaching skills as well as the content and pedagogical content knowledge needed for teaching any subject.

Torff and Murphy (2019, 2020) emphasize these important points by arguing that a major reason for the ELL achievement gap is that ELL students often are not offered a rigorous curriculum, even when it is recommended as appropriate. And when used, teachers often choose less rigorous activities and expectations when teaching ELL students. The result, not surprisingly, is lower ELL academic achievement. Tarff and Murphy argue there is a self-fulfilling prophecy: ELL students receive less than rigorous instruction, which limits their performance, which justifies the lower expectations, all the while non-ELL students receive more rigorous instruction and achieve at a higher level.

The solution, Torff and Murphy argue, is knowing the difference between the academic demands of a curriculum and the linguistic demands – and then for teachers to provide the linguistic supports that allow the ELL students to meet the same rigorous achievement standards in all content areas as other, native English-speaking students. In part this is also the approach and goal of Sheltered English instruction. Teachers need to teach both academic content and the academic language that is part of that content, which is a more demanding challenge for ELL students. Intensive PD is needed to help teachers acquire these language support skills.

Educators know that ELL students from lower income and less educated backgrounds struggle most in school and need extra help to learn both academics, regular English and content-related academic English. The EB Model addresses this need by ensuring the ESL resources triggered by ELL counts are *in addition to* other Tier 2 intervention resources including tutoring, pupil support, extended-day and summer school.

Given this allocation of one teacher position for every 100 ELL students, it is important to understand that the EB Model provides all ELL students with additional language resources *as well as* tutoring, additional pupil support, extended day, and summer school. This is all in addition to the assumption that districts provide Sheltered English instruction in classrooms that enroll ELL students.

2024 Evidence-Based Recommendation: Provide 1.0 position for every 100 ELL students. Note this is in addition to the tutoring, pupil support, extended-day and summer school resources also generated by ELL students.

27. Special Education

Providing appropriate special education services, while containing costs and avoiding over identification of students, particularly minority students, presents several challenges (see Levenson, 2012). Many mild and moderate disabilities, particularly those associated with students learning to read, are correctable through strategic early intervention– before a student is identified as an individual with a disability and an IEP is created. This intervention includes effective core instruction as well as targeted Tier 2 intervention programs, particularly one-to-one tutoring and high dosage tutoring (Elements 6 and 21).

For students with mild and moderate disabilities who require special programs as identified through an IEP, the EB Model relies on a census-based formula that provides additional teaching 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 and profound disabilities, the EB Model recommends that the state pay the entire cost of their programs, minus federal funds for these programs, up to 2 percent of all students. This section also addresses the issue of related services: speech and hearing disabilities, and the need for Occupational and/or Physical Therapy (OT and PT).

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 bulk of the April 2017 issue of *Educational Leadership* provides this argument in a more advocacy-oriented manner and also includes multiple examples of how this approach can be implemented in schools and classrooms. Most states have implemented this philosophy for several years and it is the rationale behind the Evidence-Based model as well.

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., preschool, small classes, rigorous reading curriculum, 1-1 tutoring), nearly 75 percent of struggling readers identified in kindergarten and first grade can be brought up to grade level without the need for placement in special education. Other studies have noted decreases in disability labeling of up to 50 percent (see for example, Levenson, 2011; Madden, Slavin, Karweit, Dolan, & Wasik, 1993; Slavin, 1996) with interventions of this type.

That is why the EB recommendations for extended learning opportunities (Elements 21, 23 and 24) are so important. They, along with core tutoring and pupil support services, are the series of service strategies that can be deployed *before* IEP specified special education services are needed. This sounds like a common-sense approach that would be second nature to educators, but often educator practices have been rooted in a "categorical culture" that can be modified through professional development and leadership from the district office and the site principal. Further, unlike the EB funding model, many states do not provide sufficient resources for early intervention and preventive services, so students who could have been helped often end up unnecessarily in special education programs.

Using a census approach to provide most of the extra resources for students with disabilities, an approach increasingly used across the country, works best for students with mild and moderate disabilities, but only if a functional, collaborative early intervention model (as outlined above) is also implemented. At the same time, it is perfectly legal for a student's IEP to call for tutoring, extended day help or summer school services that are part of the EB Model, even though the services may not be provided by a person with a special education certification.

This proactive approach to special education became 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 of Education encouraged states and school districts to abandon the IQ-achievement discrepancy model and adopt Response to Intervention (RTI) models, also discussed above, based on 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, called 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, which is a critical part of the EB approach, include:

- High-quality classroom instruction
- Research-based instruction
- Classroom performance
- Universal screening
- Continuous progress monitoring
- Research-based interventions, that would include 1-1 tutoring
- Progress monitoring during interventions
- Fidelity measures (Mellard, 2004).

This proactive model fits seamlessly into the EB broader approach to helping all struggling students through early interventions.

At the same time, there is some emerging evidence, using the national representative sample of students called the Early Childhood Longitudinal Study (ECLS), that full inclusion classrooms can have some negative spillover impacts on students without disabilities, particularly classrooms with students with significant emotional/behavioral problems [see for example, Fletcher (2010) and Gottfried (2014)]. The authors still sanction the inclusion model but suggest that teachers need training in both how to manage such complex classrooms as well as how to provide instruction in such mixed classrooms.

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 at least explored. Students in these categories generally include severely emotionally disturbed (ED); severely mentally and/or physically handicapped; and children with the spectrum of autism. 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 would make sense to explore clustering of services where possible and design cost parameters for clustered services in each category. In cases where geographic isolation necessitates serving students individually or in groups of two or three, it would be helpful to cost out service models for those configurations as well but provide full state funding for those children. This 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.

On the Use of Paraprofessionals.

In many states across the country, school systems often use paraprofessionals to provide a significant portion of services to students with disabilities. As University of Vermont Professor Michael Giangreco argues, however, this strategy puts the least expert individuals in the role of providing instruction to the students with the most educational challenges and is not the most effective strategy. Giangreco (2015) further states that the use of paraprofessionals often occurs when schools do not have a proactive strategy for addressing the needs of students who struggle to achieve to standards and recommends, as does the EB Model, the proactive approach.

Providing another example of heavy use of paraprofessionals, individual students with severe and profound disabilities, including many students with autism, often are provided the service of a 1-1 paraprofessional aide. These practices have been studied in great depth in Vermont. Studies have found that up to half of all paraprofessionals in Vermont might be assigned 1-1 to individual students (Giangreco, 2015; Shultz, et al., 2015). Although there are situations for which a student needs an individual aide, in many cases such aides can work to the inadvertent detriment of students (Giangreco. et al., 2005) implying that the use of paraprofessionals generally as well as in the 1-1 context should be discouraged and implemented only when absolutely needed. In a recent publication, Giangreco (2021) argues that it is important to determine teacher roles before assigning paraprofessional roles (TA's in his work) for special education services, and further suggests that TA's be assigned to teachers rather than individual students.

These arguments are also reflected in the most recent Picus and Odden comprehensive study of services provided to students with disabilities in Wyoming (District Management Group, 2020). This study also found heavy use of paraprofessionals and also concluded that such a service delivery strategy was generally ineffective and should be changed.

As should be clear, the EB Model aligns with these arguments and includes few paraprofessionals, except for some students with severe and profound disabilities. Instead, the EB Model provides skilled teachers to provide the extra services needed by students who struggle to learn to standards as well as skilled teachers for the additional needs of students with disabilities.

Putting all these general conclusions into practice, Levenson (2020) and the District Management Group (2020) suggest six major emphases to make special education services for students with mild and moderate disabilities work to produce greater academic performance:

1. Focus on student outcomes, which means using progress monitoring to make sure all services produce student results, and changing those services if results are not produced.
2. Make core instruction as effective as possible, which also is an EB Model tenet. Effective core instruction is the foundation upon which effective extra help resources as well as special education services are based.

3. Ensure that all students can read, also aligned with the EB Model. Reading is the pathway to academic learning and students who cannot read will have difficulty learning any subject.
4. Provide extra instructional time during the regular school day to all struggling students every day, resources for which are provided by the EB Model.
5. Ensure that content staff provide interventions and other supports. Math teachers should provide extra help in math, reading teachers in reading, etc. Content expertise trumps more general special education endorsements.
6. Use paraprofessionals for health, safety and behavioral needs or students, NOT academic needs.

<u>Census Approach to Funding.</u>

The proactive approach to providing services to struggling students as well as students with disabilities has led to what is called the census approach to funding core special education services. The census method is accomplished by providing additional teacher resources at a fixed level.

The census funding approach for the high-incidence, lower-cost students with disabilities should be combined with a different strategy for the low-incidence, high-cost students, whose costs are funded separately and totally by the state (with the exception of basic education funding), 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 some figure (after Medicaid, federal special education grants, and other available third-party funding are applied).

Today, diverse states such as Alabama, Arkansas, California, Massachusetts, Montana, North Dakota, Pennsylvania, and Vermont all use census-based special-education funding systems. And as just noted, most new federal money under the IDEA program is distributed on a census basis. Moreover, all current and future increases in federal funding for disabled students are to be distributed on a census basis. And the census approach works best when districts and schools have the robust set of additional resources to serve struggling students that the EB Model provides before those students need an IEP.

The issue then becomes the staffing standards for the various categories in special education:

- Students with mild and moderate disabilities
- Students with severe and profound, and high cost-to-serve, disabilities
- Related services
- Costs associated with developing and continually reviewing IEPs.

Each of these is addressed below.

As context, however, we conduct this analysis by making an assumption that about 25 percent of an average of 16 percent incidence of students with disabilities could be serviced by the EB Model 's extra help resources: core tutors and school counselors, and additional tutors, pupil support, extended day, summer school and ESL resources. This would bring the percentage of students needing and triggering additional special education resources to 12 percent.

Mild and Moderate Disabilities.

At an incidence rate of 12 percent, it would be reasonable to assume that 1 to 2 percentage points of that total would be for children with severe and profound disabilities. That would leave 10 percent with mild and moderate disabilities.

The service load for special education teachers for mild and moderate disabilities ranges widely across the country, with some school districts setting the load at 15 and others at 30. And there is no national legal requirement for service loads, or to our knowledge, a national standard. In the following analysis, we assume special education teachers service an average of 20 students with mild and moderate disabilities, which is at the lower end of the range of state practice. If the incidence of such students is 10 percent, that means about 10 students of every 100 students would have a mild or moderate disability. The EB formula then needs to provide 0.5 special education teacher positions for every 100 students (the 0.5 is determined by dividing the number of mild and moderate special education students in a group of 100, which is 10, by the service load for a teacher, which is 20). In other words, 1.0 special education teacher would be needed for every 200 students, or five positions for every 1,000 students.

Nathan Levenson (2011, 2012, 2020), a national expert on effective special education servicing, also recommends, as does the above discussion, that most of the services needed by students with mild and moderate disabilities should be provided by content-expert teachers, not by less skilled special education aides. In fact, he argues that places with many special education aides serving students with mild and moderate disabilities usually work in educational sites that have few preventive services like the EB Model provides. Thus, the argument is that few – if any – aides are needed for students with mild and moderate disabilities.

The aides used by many if not most schools across the country frequently focus on behavioral issues. But rather than having aides work individually with students on behavioral issues, what is needed is a teacher behaviorist, who works with teachers to develop their skills to manage classrooms even with students with behavior challenges, including students with autism. Some of the best private schools for students with autism do not have any aides in the classroom, but the teachers are skilled in classroom management and behavior strategies. The EB Model proposal is to provide one teacher behaviorist for every 5 special education teachers. This equates to a formula of one behaviorist teacher for every 1,000 students.

District Management Group (2020) also notes that much of content services provided to students with a mild and moderate disability should be provided by content experts and not just teachers with a special education endorsement. Often the latter do not have the content expertise needed to help students learn to a content performance standard. DMG also is skeptical about “co-teaching,” the strategy of having two teachers in a classroom – one special education teacher and one content expert. Such an approach rarely works, DMG argues, and when it does it is twice as expensive so is not cost based.

The above analysis produces an EB recommendation of 5 special education teachers and 1 teacher behaviorist, or a total of 6 teacher positions, for every 1,000 students.

Related Service.

Related services include the need for speech/hearing pathologists, occupational therapy (OT), physical therapy (PT) and other services required for a student to benefit from special education services. The incidence of related services is generally half of that for mild and moderate disabilities, or five percent in this case. Further, related service personal usually service 45 students needing these kinds of related services. A group of 1,000 students, at an incidence of five percent, would have 50 students needing related services, meaning the need for related services staff per 1,000 students would be 50/45, or 1.1 related services staff positions.

This brings the total special education services staff for 1,000 students to 7.1, the sum of six positions for mild and moderate disabilities and an additional 1.1 for related services.

Psychologists.

Finally, districts need psychologists for the primary role of overseeing the development and continued review of Individual Education Programs, which must be reviewed and reassessed every three years. A typical standard for psychologists is developing 75 IEPs a year. At a special education incidence rate of 16%, a group of 1000 students would have 160 who needed an IEP. As IEPs are reviewed every three years, that reduces the burden to 53. On the other hand, for every 1000 PreK-12 students, there typically is the need to administer an IEP review process for an additional 20 or so students for incoming preschoolers, kindergartners and first graders, many of whom would need the review but most of whom would not actually receive an IEP. This adds to the 53 another 20 IEP reviews for a total of 73. Thus, at a typical load of 75, a group of 1,000 K-12 students would trigger the need for an additional 1.0 psychologist.

Severe and Profound Disabilities.

The EB approach for children with severe and profound disabilities is for the state to fund 100% of the extra costs for students with severe and profound disabilities, minus federal Tile VIb. To control costs for this recommendation, the EB Model would limit the number of students so covered to 2 percent of students in the district.

2024 Evidence-Based Recommendation for Special Education:

- *8.1 positions for every 100 students, which includes:*
  - *7.1 positions per 1,000 students for services for students with mild and moderate disabilities and for the related services of speech/hearing pathologists and/or OT, PT. This equates to approximately one position for every 141 students.*
  - *1.0 psychologist positions for 1,000 students (included in the Central Office)*
- *This recommendation results in the following resources at prototypical schools:*
  - *3.20 special education positions for every 450-student elementary school*
  - *3.20 special education positions for every 450-student middle school*
  - *4.25 special education positions for every 600-student high school*
- *100 percent state funding for services for students with severe and profound disabilities, minus federal Title VIb funds, capped at 2% of all students*

28. Career Technical Education (CTE)

The EB Model provides extra CTE resources based on the number of CTE teachers.

The EB Model does not recommend any additional teachers for CTE courses because our analyses (see below) of recommended class sizes for the more modern types of CTE courses – computer science, pre-engineering/computer assisted design, and the bio- and health tech programs – show that the class size provided by the EB Model recommendation of 25 students is adequate for these newer types of CTE programs.

Over the past decade, vocational education, or its modern term – career and technical education – has experienced a shift in focus across the nation. Traditional Voc-ED often addressed practical, applied skills needed for wood and metal working, welding, automobile mechanics, typing and other office assistance careers, as well as home economics. Today, many argue that Voc-ED should be Voc-tech including info-tech, nano-tech, computer-tech, bio-tech, and health-tech. Today's CTE supporters argue that CTE should begin to aggressively incorporate courses that provide students with skills for positions in the emerging and higher skill/higher wage economy that can be entered directly from high school. The American College Testing Company and many policymakers have concluded that the knowledge, skills, and competencies needed for college *and for work in these higher wage, higher skill jobs* are similar.

Funding legacy CTE programs is no longer a focus of the new Federal Perkins V Act (Senate File 143). The new Federal Perkins Act V allows CTE to be recognized for the upper levels of the state high school graduation requirements and many college admission requirements. In addition, business and industry often partner with schools to redesign CTE programs to create a springboard to align to CTE high skill, high wage and high demand careers in the state.

If states want to be serious about educating its youth in career pathways that will allow them to earn a living and support a family, as well as create a quality life, then the state must assure students have access to career exploration in middle and junior high and even elementary schools that leads to high quality CTE programs at the high school and postsecondary level. As argued below, Project Lead the Way is a high quality CTE program that creates elementary through high school pathways to careers in engineering, computer science and biotechnology, and its costs can be covered by existing elements in the Funding Model.

Moreover, this paradigm shift from legacy Voc-ED to CTE requires sufficient funding for and support of high quality CTE. High quality CTE includes many aspects. A high quality CTE program begins with a CTE or provisional industry certification (PIC) licensed teacher who is current in his or her content area and receives support to remain current in his or her content area. The program must have adequate space and access to equipment/technology that reflects what is currently being used in business and industry. The program must also offer exposure to innovative and emerging technologies while ensuring student safety. Quality programs allow students to participate in work-based learning opportunities, earn college credit through dual or concurrent enrollment while enrolled in high school, and to participate in co-curricular career and technical student organizations. High quality CTE programs also offer an integrated sequence of at-least three courses. Upon completion of a high quality CTE program students should be able to demonstrate skills by attaining an industry recognized credential of value.

The EB Model has supported high quality CTE programs since 2005. Further, there are now several emerging studies that show high quality CTE programs do have a positive impact on student learning, increased high school graduation rates, employment after high school, and wage levels. Using data from the 1997 National Longitudinal Survey of American Youth, Kreismanm and Stangem (2020) found that students largely self-selected into vocational education and CTE courses and those courses were not dumping grounds for low achieving students as some have asserted in the past. They also found that students who took CTE courses at the upper levels – i.e., learned in depth in one area –were more likely to graduate from high school and also experienced a two percent increase in subsequent wages for each additional year of vocational education or CTE courses. Kreismanm and Stangem also found that students taking only introductory CTE courses did not experience these benefits. These findings support the current CTE emphasis on students' taking a sequence of CTE courses that add up to expertise and certification in a specified area.

Plasman, Gottfried, & Klasik (2020) found that over the past decade students who enrolled in CTE classes in the earlier years of high school tended to continue to enroll, thus taking more sequences of CTE courses and upping their chances of high school graduation. Similarly, Dougherty's (2016) study of career technical programs in Arkansas (see also Dougherty, Gottfried & Sublett, 2019) found that students who took three or more coherent CTE classes (a key element of high quality CTE programming) were 21 percentage points more likely to graduate from high school in four years, and 25 percentage points more likely to graduate from high school if the student was from a low-income background. These students also were more likely to attend two- and four-year colleges, to succeed in those college settings, and to earn higher wages after high school. This represents one study that shows the potential power of the CTE approach. Importantly, the study found that such programs did not track low-income students into low quality vocational or career-tech programs.

Dougherty (2018) came to similar conclusions after studying the CTE programs in Massachusetts. The study investigated the causal impact of participating in a specialized high school based CTE delivery system on high school persistence, completion, earning professional certifications, and standardized test scores, with a focus on individuals from low-income families. The results suggested that participation in a high-quality CTE program boosted the probability of on-time graduation from high school by seven to ten percentage points for higher income students, and possibly even larger effects for their lower-income peers. Dougherty notes that these impacts on high school graduation complement previous research findings that participation in high quality CTE programs produces longer term increases in earned income. Dougherty and Smith (2022) further conclude that these programs are cost effective. However, if the states they studied – Connecticut and Massachusetts – funded their schools at the level of the EB Model, the "extra" costs would be *de minimis* making cost effective calculations even better.

For years, we have identified Project Lead the Way (PLTW) (www.pltw.org) as a nationally prominent exemplar of high quality CTE education. Often implemented jointly with local postsecondary education institutions, employer advisory groups, and local companies that provide internships and cooperative opportunities, these programs usually feature project or problem-based learning experiences, career planning and guidance services, and technical and/or academic skills assessments. Through hands-on experience preparing students for the real world, the program is designed to develop the science, technology, engineering, computer science and mathematics skills essential for achievement in the classroom and success in college or jobs not requiring a four-year college education.

PLTW has a K-12 sequence in computer science, engineering and biomedical sciences. At all levels the courses and modules are designed to impart knowledge and skills, applying those knowledge and skills through a variety of hands-on projects, and then encouraging students to use that newly acquired expertise to explore additional novel problems. The sequences at all three levels are aligned to both national mathematics and reading standards, as well as the new science standards. The elementary Launch program includes 43 different modules across grades K-5/6 which, if adopted schoolwide, could be the science curriculum for the school.

The Launch program is designed to ensure that all students are prepared for the more rigorous PLTW programs in middle school. Whether designing a car safety belt or building digital animations, students engage in critical and creative thinking, build teamwork skills, and learn to try and try again when faced with challenges. The middle school Gateway program is designed to spark a joy of discovery in science and technology areas and provides experiences in a range of paths – engineering, biotechnology and computer science -- students can look forward to pursing in more depth in high school and beyond. Students apply knowledge and skills from a variety of disciplines. By tackling challenges like designing a therapeutic toy for a child with cerebral palsy, creating their own app, or solving a medical mystery, students are empowered to make a real-world impact.

The high school program has three major areas: computer science, engineering and biotechnology. There are 11 engineering courses, four biomedical courses and 4 computer science courses (www.pltw.org). In 2018, PLTW was offered in more than 5,000 elementary, middle and high schools in all 50 states and enrolled over 500,000 students.

The curriculum features rigorous, in-depth learning experiences delivered by certified teachers and end-of-course assessments. High-scoring students earn college credit recognized in more than 100 affiliated postsecondary institutions. Courses focused on engineering foundations (design, principles, and digital electronics) and specializations (e.g., architectural and civil engineering, bio-technical engineering) provide students with career and college readiness competencies in engineering and science. Students need to take math through Algebra 2 in order to handle the courses in the program, which also meet many state standards for science and other mathematics classes. It should be noted that there are clearly multiple links between STEM and the curricula of newer CTE courses, so emphasizing CTE over Voc-ed would naturally increase STEM classes.

Massachusetts is scaling up PLTW. For the first year of a six-year scale-up, Papay (2019) found that Project Lead the Way had a high school student performance effect size of 0.14 for English/language arts, 0.16 for mathematics and 0.18 for science.

One issue often raised is the cost of high quality CTE programs, such as PLTW. Many districts and states believe that these new career-technical programs cost more than the regular program and even more than traditional vocational classes. But in a review conducted for a Wisconsin school finance adequacy task force, (Phelps, 2006) concluded that the best of the new career-technical programs did not cost more, especially if the district and state made adequate provisions for professional development (as teachers in these new programs needed training) and computer technologies (as computer technologies were heavily used). These conclusions generally were confirmed by cost analyses we have conducted of PLTW for Wyoming. And the Washington State Institute for Public Policy found that PLTW produces benefit-cost ratios above 7, meaning that for every dollar invested in the program, $7 of benefits were produced (Washington State Institute for Public Policy, 2017).

The major potential cost areas for the PLTW program are class size, professional development, and computer technologies. Most programs recommend class sizes of 25, which is what the EB Model recommends for high schools. The professional development and most of the computer technologies are covered by the professional development and computer allocations of the EB Model discussed above in this report. Further, PLTW training for teachers now can be accessed in an on-line format so is available to all schools, even remote, isolated rural schools. The program also has a training program for “lead” teachers who can then train other teachers in the school or district. Some of the PLTW concentration areas require one-time purchase of expensive equipment, which could be covered by approximately $10,000 per career-technical education teacher.

Elementary and middle school programs also require students to have access to the internet and Chromebooks. As described above, the computer and technology element of the EB funding program provides for most of the technology required for PLTW.

Thus, short of the costliest PLTW programs, which are usually funded jointly by schools and local businesses (Sawchuk, 2020), the EB funding model provides sufficient resources, for high quality CTE programs. All these cost figures, except for the $10,000 per CTE teacher, can be covered by the core EB provisions.

2024 Evidence-Based Recommendation: Provide $10,000 for each CTE teacher – one in each prototypical high school.

CHAPTER 4
CALCULATING AN ADEQUATE EXPENDITURE LEVEL FOR VERMONT

Using the Evidence-Based (EB) Model developed by Picus Odden & Associates**,** an estimated per pupil adequate expenditure level for Vermont was estimated. **This study estimates that an adequate expenditure base per pupil level for Vermont is $11,466 for fiscal year 2024. The model also estimates that ELL students require additional funding of $5,017 per pupil and low-income students require an additional $3,946 per pupil**, which equate to pupil weights of 0.44 for ELL students and 0.34 for low-income students, assuming half the eligible students attend summer school and extended day programs. The weights increase to 0.58 and 0.49 if all or 100 percent of eligible students attend those programs.[25]

The EB Model only estimates expenditures that are part of education costs. It does not include capital investment, debt service, transportation, meal services, or local special education spending. After adjusting for school district expenditures not included in the EB Model, **the study finds that the model's total cost for PK-12 education in Vermont is lower than current total expenditures – the Education Fund Payment.** Depending on the assumptions used for summer school and extended day participation, **the difference ranges from $400.4 million to $462.7 million less than is currently spent by Vermont's PK-12 education system.**

These findings are summarized in Table 4.1:

Table 4.1

	FY24 Vermont Expenditures	**EB Model Estimates of Adequate Spending**		**Difference** *(Amount Vermont amount exceeds EB Model Adequate Costs)*
		Bottom of range	Top of range	
Education Payment *(millions)*	$1,711.1	$1,248.4	$1,310.7	$400.4 to $462.7
Per Pupil Education Fund Payment	$16,869	$12,307	$12,921	$3,984 to $4,562

This chapter describes how these conclusions were reached. In the previous chapters, the report identifies the EB Model 's evidence-based the staffing ratios and dollar per pupil resources needed to boost student performance. Using these ratios and dollar per pupil resources, an Excel-based simulation estimates the corresponding Adequate Expenditure Per Pupil, and related pupil weights for English Language Learner students, and non-ELL poverty students. The following sections provide more details into how these figures were produced using the core numbers and ratios in Table 3.1 (found on page 16).

[25] Vermont's current law weight for ELL students is 2.49 and for low-income students, 1.03 (16 V.S.A. § 4010).

ESTIMATING AN ADEQUATE EXPENDITURE LEVEL

To compare the EB Model 's estimated education costs with Vermont's Education Fund Payment, the following steps were taken:

1) Determined the average compensation (salary and benefits) for each category of school personnel in the model,
2) Using these figures and the staffing ratios and dollar per pupil figures in Table 3.1, computed the adequate expenditure per pupil for all students,
3) Computed the additional costs for ELL and low-income students, and related weights for each category,
4) Computed the total EB estimated adequacy cost, and then
5) Compared the EB total adequacy costs to Vermont's 2024 Education Fund Payment.

Step 1 - Personnel Compensation

School personnel are a significant component of the cost of public education. The first step in estimating costs of the model was to determine the average compensation (salary and benefits) for each category of school personnel in the model.

In order to compute these estimates, salary and benefit data provided by the Vermont Agency of Education (AOE) for the 23-24 school year was utilized. Table 4.1 shows the salary data used in the estimates. The data received from the AOE included many more categories than are displayed in Table 4.1. Each position was in the AOE data set was assigned to one of the categories utilized by the EB Model, then the average salary for that category were computed. Those combined averages are what appear in Table 4.1. In other words, Table 4.1 shows Vermont's average salary for different positions in the 23-24 school year.

TABLE 4.1
VERMONT SCHOOL YEAR 2023-24 AVERAGE SALARY BY POSITION[26]

Position	Certified or Classified	Average Salary
Principal	Certified	$110,810
Assistant Principal	Certified	$98,189
Teacher	Certified	$68,930
Instructional Coach	Certified	$70,589
Substitute Teacher	Certified	$68,930
Guidance Counselor	Certified	$65,610
Nurse	Certified	$67,192
Instructional/Supervisory Aide	Classified	$28,313
Library Media Specialist	Certified	$71,187
School Secretary/Clerical	Classified	$46,103
Custodian	Classified	$30,987

[26] Positions have been ordered in the table by first listing staff in schools, then maintenance and operations staff, and finally central office staff. This order corresponds with the order in the corresponding Excel Model.

Position	**Certified or Classified**	**Average Salary**
Maintenance Worker	Classified	$45,736
Grounds Maintenance	Classified	$45,736
Superintendent	Certified	$155,667
Business Manager	Classified	$111,775
Director – Personnel/HR	Classified	$73,330
Asst. Supt. of Instruction	Certified	$118,473
Director of Pupil Services	Certified	$94,436
Director of Assessment	Certified	$94,436
Director of Technology	Classified	$94,436
Director of O&M	Classified	$94,436
Secretary/Clerical	Classified	$53,583
Network/Systems Supervisor	Classified	$80,380
School Computer Technician	Classified	$58,992
Psychologist	Certified	$79,315

To estimate total compensation, the model uses a benefit rate of 36.1% of salary for all positions. This figure was derived through discussions with AOE and based on actual district expenditures for employee benefits. As no better data were available, we used 36.1% as an overall average benefit rate across all school district staff. Typical benefits for school staff include health care, dental, etc. It does not include retirement costs as they are not part of education spending at the district level.

Step 2 - Estimating the EB Adequate Per-Pupil Base Expenditure Level

The Excel model was used to estimate the EB Adequate Per-Pupil Base Expenditure Level. This estimate was based on the staffing and dollar resources identified in Table 3.1 (see page 16), and the compensation figures in Table 4.1.

This resulted in the estimated FY24 EB Adequate Per-Pupil Base Expenditure Level of **$11,466**.

Step 3 - Estimating The Additional Costs And Associated Weights For ELL And Low-Income Students

The Excel Simulation also estimates the costs of additional programmatic resources for ELL and low-income students and computes the associated weights for each identified student. The additional funding needed to provide further services to ELL students was estimated to be $5,017, which produces an extra weight of 0.44.[27] The additional funding needed to provide further services to low income (or poverty or Free and Reduced Lunch /FRL) students was estimated to be $3,946, which produces an extra weight of 0.34.[28] These weights assume that

[27] This is calculated by dividing the additional cost for ELL students by the adequate per-pupil base expenditure level. ($5,017/$11,466).
[28] This is calculated by dividing the additional cost for low students by the adequate per-pupil base expenditure ($3,946/$11,466)

50% of eligible students attend summer school and extended day programs. All weights are rounded to the nearest hundreds.

An additional weight for ELL and FRL students was calculated under the assumption that 100% of eligible students enrolled in extended day and summer school programs. Based on participation research cited earlier in this report, the core EB Model assumes that half the eligible students will attend these programs, producing the ELL and FRL or poverty weight of 0.44 and 0.34 respectively. The assumption of 100% participation by eligible ELL and FRL students in extended day and summer school programs produces higher weights of 0.58 and 0.49 for ELL and FRL respectively.

Step 4 - Estimating an EB-Based Adequate Spending Level for PK-12 Vermont

The next step in our analysis was to estimate an adequate spending level for PK-12 in Vermont.

PK-12 Analysis

To estimate an EB- Based Adequate PK-12 spending level, the number of pupil counts – core ADM, ELL ADM, non-ELL FRL (poverty) ADM, preschool ADM and small school ADM – were identified. To accomplish this task, the AOE provided the FY24 ADM, PreK ADM, as well as the ADM for ELL students classified as both ELL and FRL, ELL students not classified as FRL, FRL students who are not ELL students. The goal was to use an unduplicated count of both ELL and FRL students, and to capture all of the weights in the EB Model. Thus, the total ELL count we used is the sum of the *ELL classified as both ELL and FRL* and the count of *ELL students not classified as FRL*. AOE's count of PreK students was also used.

Small School Analysis

As noted elsewhere in this report, we followed our EB methodology to create one district level adequate expenditure per pupil estimate; this estimate does not address the higher costs associated with the many small schools in Vermont. However, we made one adjustment for the additional costs of small schools. To do this, we used imputed weights from our 2015 Vermont adequacy study. That study created additional prototype schools at each level (Elementary, Middle and High School) to address the diseconomies of scale present in smaller schools. Taking the average from the small, medium, and large prototypes, weights of 1.08 for schools with less than 150 ADM, 1.08 for schools with between 151 and 300 ADM, 1.01 for schools with between 301 and 450 ADM, and 1.00 for schools larger than 450 ADM were derived. Using these weights, an additional 3,129 WADM across the state was computed.

These findings were used to compute the total number of weighted students (WADM) in Vermont. Specifically, this was done by taking the weights generated through the EB Excel-based Simulation as well as the small school weights and multiplied them by the number of students in each category. These results are displayed Table 4.2.

The columns in Table 4.2 show that total EB WADM is estimated at 101,436 (bottom line of Column 4), including PK students and assuming 50% of students participate in extended day and summer school programs. Total EB WADM is estimated at 106,866 (bottom line of Column 6), including PK students and assuming 100% of students participate in extended day and summer school programs.

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TABLE 4.2
EVIDENCE BASED WADM

		50% Participation		100% Participation	
1	**2**	**3**	**4**	**5**	**6**
Category	**Count**	**Extra Weight**	**WADM**	**Extra Weight**	**WADM**
ADM	82,551	--	82,551	--	**82,551**
ELL	1,869	0.44	823	0.58	**1,084**
FRL	34,461	0.34	11,717	0.49	**16,886**
Size Adjusted			3,129		**3,129**
PreK	7,146	0.45	3,216	0.45	**3,216**
Total WADM			**101,436**		**106,866**

To produce a total EB estimated adequacy cost assuming 50% participation in summer school and extended day programs, total WADM (101,436: Column 4 of Table 4. 2) was multiplied by the EB per pupil estimate of $11,466. This produced a total estimated EB adequacy cost of $1,163 million, based on 50% participation in extended day and summer school.

To produce a total EB estimated adequacy cost assuming 100% participation in summer school and extended day programs, total WADM (106,866: Column 6 of Table 4.2) was multiplied by the EB per pupil estimate of $11,466. This produced a total estimated EB adequacy cost of $1,225.3 million, based on 100% participation.

Step 5 – Comparing the EB Cost Estimate with Current Vermont School Spending

The last step was to compare the total EB adequate expenditures with current Vermont education spending. The FY Education Fund Payment of $1,711.1 million was used in order to have a comparable figure. However, to make an apples-to-apples comparison, two expenditure categories that are in the Education Fund Payment but not in the EB total needed to be added. These are special education and transportation.

Because the bulk of special education is funded through categorical aid, we have not included special education costs in the EB total. But because district expenditures for special education above and beyond the funds provided by both federal and state categorical programs are included in the Education Payment, it was determined that these should be added to the EB totals. To make this addition, estimates of special education costs in the Education Payment from the AOE’s January 2024 survey of school districts were utilized. An estimated cost of special education that can be assigned to the Education Payment is $58.8 million and we added this amount to the total EB cost.

Additionally, Vermont shares transportation costs with school districts, and the districts' share is included in the Education Payment. Because Transportation costs are not included in the EB Model, an estimated local share of pupil transportation costs of $26.7 million was added to the EB total as well.

The result of including these two additional expenditure categories produced a total EB cost of $1,248.5 million for the 50% participation rate model, and $1,310.7 million for the 100% participation model, as shown in Line 4 of Table 4.3. Table 4.3 (line 6) also shows that current Vermont Education Fund Payment exceeds the EB Model Adequate spending level estimate by $400.7 to $462.7 million dollars depending on the extended day and summer school participation rates of ELL and low-income (FRL) students.

TABLE 4.3
COMPARISON OF FY24 VERMONT TOTAL EDUCATION FUND PAYMENT WITH ESTIMATED EB MODEL ADEQUATE COSTS

		Participation Rate of ELL and Low Income (FRL) Students	
		50%	**100%**
		Millions of Dollars	
1	EB Estimated Adequate Costs	$1,163.0	$1,225.3
2	Add Special Education	$58.7	$58.7
3	Add Transportation	$26.7	$26.7
4	Total EB Estimated Adequate Costs	$1,248.4	$1,310.7
5	Vermont Education Fund Payment	$1,711.1	$1,711.1
6	Difference (Amount Current Education Fund Payment Exceeds EB Model Adequate Costs)	$462.7	$400.4

CONCLUSIONS AND NEXT STEPS

Driven by the policy and financial conversations in Winter of 2023-2024 about the cost of public education and its impacts on property taxes and student performance in Vermont, the Legislature commissioned Picus Odden & Associates to update their Evidence-Based Model (EB Model) to identify a spending level that could provide an adequate amount of funding needed to educate public school students and achieve successful outcomes. Adequate is defined as providing a level of resources (with appropriate adjustments for size and geographic cost differences) that would enable schools to provide every student with an equal opportunity to learn to high performance standards.

The Evidence-Based (EB) model is designed to identify the array of staffing and resources that high-performing schools need to provide every student with robust opportunities to meet college and career ready standards; performing to those standards would substantially improve student achievement and reduce demographic related performance gaps.

It is Picus and Odden's professional position that if Vermont provided school funding at the level of the EB Model and if Vermont's schools used the resources in the model as indicated in Chapter 3, then student achievement in Vermont would substantially improve.

This study finds that estimated adequate costs for PK-12 education in Vermont are *less* than the current Education Fund Payment, the most appropriate comparison expenditure figure.[29] Depending on the assumptions used for summer school and extended day participation, the EB Model 's **estimated adequate spending is $400.4 million to $462.7 million *less* than Vermont's current Education Fund payment.**

To reach these conclusions, this study leveraged academic research to determine the model's prototypical size of schools and school districts and adequate spending levels. These sizes are larger than some (if not all) of Vermont's schools and districts. In other words, this report computes an estimated adequacy expenditure level based on assumptions about school district organization that differ substantially from Vermont's current governance structure.

It is not surprising that the estimate is lower that current expenditures given the diseconomies of scale typically found in schools as small as those in Vermont. It is a policy choice to maintain a certain number of school districts and buildings, and this decision influences overall costs. **Vermont's current structure with many small schools and school districts likely results in higher costs that are not fully addressed in this analysis.** In addition to its many small schools and complex governance, Vermont also maintains an extensive and complex system of tuition payments for secondary education and for private schools. This further complicates the interpretation of the analysis in the context of adequacy and policy decisions.

The scope of this report was to provide the "district" level estimates contained herein. These estimates are based on academic research and do not factor in the current landscape of Vermont's policy choices regarding governance.

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[29] For a fair comparison, adjustments for educational expenditures not included in the EB Model were made, including estimates for local special education, food service, Debt service, Capital construction, and transportation expenditures.

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(* refers to randomized controlled trials)

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