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Resource Allocation in Maine's More Efficient Public High Schools

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RESOURCE ALLOCATION IN MAINE'S MORE EFFICIENT PUBLIC HIGH SCHOOLS

By

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B.S. University of Maine at Farmington, 1987
M.S. University of Southern Maine, 1995

A DISSERTATION

Submitted in Partial Fulfillment of the

Requirements for the Degree of

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May, 2015

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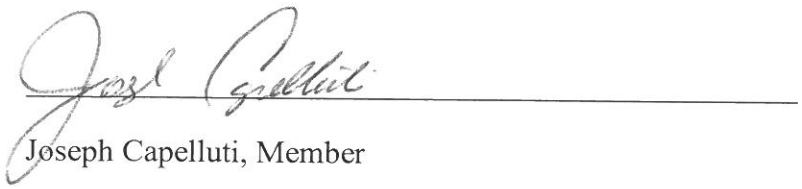

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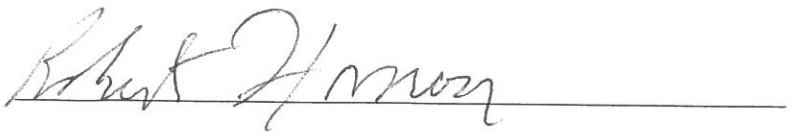

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By Andrew R. Dolloff, M.S.

Dissertation Advisor: Dr. David Silvernail

An Abstract of the Dissertation Presented
In Partial Fulfillment of the Requirements for the
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This mixed-methods study compared three-year average operating expenditures and resource allocation practices and policies of nine Maine high schools that had been identified in a previous study as being "more efficient" with those of nine "typical" Maine high schools. The study attempted to determine if more efficient schools allocate resources differently than typical schools.

The quantitative portion of the study considered expenditures of 18 Maine high schools over a three-year period using three resource models: The Maine Department of Education (MDOE) warrant article model; the National Center for Education Statistics (NCES) account code model; and (the Roza and Swartz (RS) School Spending Profile. Expenditures were sorted by object type, and the average percent of total per-pupil expenditures was determined. Comparisons among the three resource models were made through the use of descriptive and inferential statistical procedures, and the calculation of effect sizes.

The qualitative portion of the study consisted of interviews with six school administrators representing three more efficient high schools and three typical high

schools. Additional qualitative analysis was conducted through a document review of fiscal policies for each of the schools. Through the qualitative study, the researcher sought to determine if more efficient high schools followed different practices in allocating expenditures than did typical high schools.

The quantitative analysis revealed that more efficient schools did allocate fiscal resources differently than typical schools, and that different resource allocation models showed differences in expenditures between the two types of schools to varying degrees. The findings revealed that greater efficiency is not a product of student demographics, faculty salaries, or operational expenditures. The study also showed that more efficient schools do not spend less than typical schools in every expenditure category: they spend more on regular instruction, and a greater percentage of expenditures on special education instruction, and co-curricular activities.

The qualitative analysis revealed no differences between the ways in which more efficient schools and typical schools identify budget priorities, and develop resource allocation plans, known as annual operating budgets.

The study findings indicate that more efficient schools focus more resources on instruction than do typical schools. The study findings also suggest that local policymakers may find using resource allocation models such as the NCES model and the RS model, and more aggressive budget development processes such as zero-based budgeting, to be beneficial in studying their own expenditure practices and priorities.

DEDICATION

From 1958 until 1995 my father, Ronald Dolloff, touched the lives of thousands of students. First as a teacher of mathematics – which he still considers "the queen of the sciences" – and then as a high school principal, his influence remains palpable to those who were fortunate enough to attend Medomak Valley High School under his watch. For the past 28 years, I have attempted to live up to the standard he set as an educational leader and, more importantly, as a person. Someday, I hope to reach that goal, and I thank him for setting the bar high enough that I will always have something toward which to strive. Of course, he might have accomplished far less without the backing of my devoted mother, who made sure that he and my sisters and I were well cared for in every regard. Her 57 years (and counting) of support behind the scenes is a testament to her commitment to our family.

Mariah and Caleb will never know how proud I am to be their father, as I cannot begin to understand it myself. They motivate and inspire me every day. To see them at their high school and college graduation ceremonies, moving ahead with their own aspirations and creating new adventures, encourages me to continue learning and seeking new experiences for myself. Similarly, Kristen and Megan are the best step-daughters a man could have. Their focus and dedication to learning is admirable in every way, and I am continually motivated to being as committed to personal excellence as they have modeled over the years.

The Austrian composer, Franz Schubert, is credited with saying, "Happy is the man who finds a true friend, and far happier is he who finds that true friend in his wife." I am among the fortunate ones Schubert was describing; nothing I accomplish is done without Brenda's enduring support. She is a tireless cheerleader, compassionate confidante and trusted advisor. Her assistance in this endeavor was tangible, from teaching me the intricacies of pivot tables to redesigning the elementary appearance of the figures and tables printed in this dissertation. It is her daily encouragement and endless positive energy that sustains and motivates me. Her presence is a guiding light.

ACKNOWLEDGEMENTS

I would like to thank Dr. Joseph Capelluti and Dr. Robert Hasson, two members of my dissertation committee, for their expertise, perseverance, and mentorship through this process. I must especially express gratitude to my dissertation chairperson, Dr. David Silvernail, for the countless hours he spent reading and editing this manuscript. The sage advice he provided throughout the study made this project both manageable and enjoyable. Had he not been willing to play such an integral role – and had he not set as his goal that I would be completed prior to his impending retirement – this endeavor would have been in peril from the outset.

I must also mention the assistance provided by James Sloan at the Center for Education Policy, Applied Research, and Evaluation. James provided the reams of raw expenditure data that would have otherwise taken weeks, or months, to obtain, and I am indebted to him for his voluntary effort.

Dr. Catherine Fallona provided critical advice as the end of the dissertation process drew near, making the completion of the project as smooth as possible, and Dr. Anne Ruffner Edwards assisted in placing the finishing touches on the project with her expert editing skills.

It truly takes a concerted effort to shepherd one through the dissertation process, and I benefitted from being part of such an outstanding team.

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CHAPTER I: INTRODUCTION

Purpose of the Study

The purpose of this study was to explore the fiscal practices of Maine's more efficient public high schools in an attempt to determine if there is a difference between these schools and typical schools in how and where they allocate resources. This study examined the relationship between school expenditures and student performance in light of the fact that much of the research surrounding that topic has indicated no clearly defined relationship between the two. However, most researchers have considered overall school expenditure or overall per-pupil expenditure as the financial metric, whereas this study looked at categorical per-pupil expenditures of higher-performing, more-efficient high schools to determine if they employ practices of resource allocation that differ from typical high schools.

Context

The juxtaposition of education spending and student outcomes has become a significant and persistent dialogue in America over the past 40 years. From the release of the U.S. Department of Education's *Equality of Educational Opportunity* report (Coleman et al., 1966), more commonly known as the Coleman Report, public schools in the U.S. have been criticized for being ineffective, inefficient, and resistant to change. Mandated by Congress as a result of the Civil Rights Act of 1964, and conducted by what was then known as the United States Office of Education, the Coleman Report is considered by leading educational researchers to be a seminal document investigating the effects of school spending on student performance (Hanushek, 1997). "The investigation of the effects of school resources began in earnest with the publication of the Coleman

Report. Subsequent attention was directed both at understanding the analysis of the Coleman Report and at providing additional evidence about the effects of resources." (Hanushek, 1997, p. 141).

Looking at more than 600,000 students and teachers across the country, Coleman and his colleagues were tasked with studying the availability of public educational opportunities for students of race, color, religion, or national origin. In the final analysis, their findings proclaimed that schools in the United States did not exert much influence at all on student achievement:

> Schools are remarkably similar in the way they relate to the achievement of their pupils when the socioeconomic background of the students is taken into account. It is known that socioeconomic factors bear a strong relation to academic achievement. When these factors are statistically controlled, however, it appears that the differences between schools account for only a small fraction of differences in pupil achievement. (Coleman et al., 1966, p.22)

In the nearly five decades since its release, the Coleman Report has been cited as the initial research considering educational equity and the effectiveness of public schools in America. In 1968, Kent recognized how transformational the Coleman findings had already become in changing the discussion about school effectiveness from one about inputs (facilities, class size, and resources) to one of outputs (student performance). "Increasingly, educational research, discussions, decisions, and even time are measured as pre-Coleman Report or post-Coleman Report" (Kent, 1968, p. 242). Thirty-two years

later, in an article in *Johns Hopkins Magazine*, Kiviat (2000) reminds us of the impact of the report by restating the Coleman findings:

> The researchers found that academic achievement was less related to the quality of a student's school, and more related to the social composition of the school, the student's sense of control of his environment and future, the verbal skills of teachers, and the student's family background. (p.1)

Almost immediately after the 1966 publication of the Coleman Report, educational researchers took on the task of dispelling Coleman's work. Klitgaard and Hall (1974) were among the most critical – and creative – saying it measured the wrong things and, therefore, arrived at the wrong conclusions. In response to the Coleman Report, Klitgaard and Hall claim:

> A number of rather drastic alternatives are open. One is to accept the Coleman results and declare them the fault of the entire educational system. On this view, educational effectiveness can only come about through radical reform of our whole way of schooling. Another alternative is to reject Coleman's findings on the grounds that the wrong things were measured. One should stop reading the statisticians and economists and start reading Plato and Dewey on the true goals of education. Or there is despair. Perhaps one should leave the educational field and go into something like bartending, where the results are clear-cut, the recipients thankful, and the emoluments more gratifying. (p. 91)

Klitgaard and Hall selected the second alternative, claiming that Coleman's group measured the wrong things by arriving at an average value for school effectiveness,

essentially dismissing the schools on the higher end of the scale that provided evidence of positive impacts on students.

> Previous studies have indicated that *on average* school policies do not have much effect on measurable student outcomes. Suppose this is true. Might there not remain, nevertheless, a group of unusually effective schools that are different? Are there any *exceptions* to small average tendencies and insignificant regression coefficients? (p. 91)

Rather than looking at average effects of schools, Klitgaard and Hall set about identifying unusually effective schools – those that consistently produced better results even after allowances were made for the individual characteristics of its students.

A significant group of educational researchers joined Klitgaard and Hall (Edmonds, 1983; D'Amico, 1982) pointing to flaws in the methodology used to arrive at Coleman's conclusions. It was that belief – that there were identifiable effective schools throughout the country that had more of a positive impact on student performance than other schools – that led to the Effective Schools Movement. Mace-Matluck (1983) asserted the following:

> Early inspiration for the Effective Schools Movement can be said to lie in a group of studies that attempted to examine whether school resources (e.g. ratio of adults to children; number of books in the library) were associated with student outcomes (typically, performance on standardized achievement tests). (p.3)

Leading the charge for effective schools, Edmonds (1983) reported that conflicting research arose following the Coleman Report, led most notably by social

scientists like Brookover and Lezotte (1979) and himself. "These educational researchers concluded that the school is the major determinant of student achievement" (Edmonds, 1983, p. 2). In his study of hundreds of schools from several states implementing improvement programs, Edmonds (1983) found that, "While all of these programs would advocate increased financial support for schools, their designs for school improvement focus on more efficient use of existing resources" (p. 16).

D'Amico (1982) supported Edmonds's position, claiming that, "Effective schools studies have provided educational practitioners and policymakers with nearly overwhelming evidence that effective schools exist" (p. 15). Clearly, the debate over school effectiveness, at least in the modern era, had begun.

The Coleman Report was followed a mere 17 years later by *A Nation at Risk: The Imperative for Educational Reform*, a report to the nation from the President Reagan-commissioned National Commission on Excellence in Education (NCEE) (NCEE, 1983). Pointing to the decline of American schools, the report made one of the most damning and oft-repeated criticisms of U.S. public schools when it stated, "If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war" (p.1). Those two pivotal studies have spawned a great deal of philosophy, policy, research, and rhetoric, with impacts that reach from the federal to the local level even today, as the United States seeks to maximize its educational expenditures.

The premise that schools that spend more money produce better outcomes is widely disputed. The research comparing school expenditures and student performance is mixed, with no clear record to state that the two are, or are not, related. Studies that have

focused on specific expenditures, programs or grade levels have been more definitive in identifying a potential relationship between spending and achievement, while those that look more broadly at per-pupil expenditures tend to show no relationship between the two.

This research study was designed to explore if there are fiscal policies or practices that are common to Maine's higher-performing, more-efficient public high schools that do not exist at typical Maine high schools. In so doing, this study was also designed to increase the level of understanding of resource allocation for Maine's public schools in an effort to assist local policymakers in increasing efficiencies within their respective districts.

Statement of the Problem and its Significance

Americans are accustomed to the axiom, "you get what you pay for," and when it appears that we have paid for more than we have received, cries of foul play, corruption, and incompetence abound. Inevitably, when combined with the economic factors that have led to higher taxes, greater unemployment, and the "flattening" of global markets, those cries have led to the politicizing of American education, with each of the major political parties making efforts to create systems that more visibly hold our schools accountable.

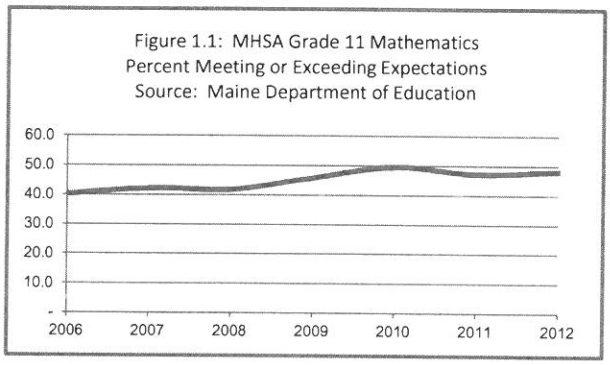
Prior to 1965, the federal government's role in public education was limited. That changed somewhat with President Lyndon B. Johnson's signing of the Elementary and Secondary Education Act (ESEA), and as successive presidents began to discuss education policy on a more consistent basis. In 2002, President George W. Bush reauthorized ESEA and renamed it the No Child Left Behind Act (NCLB), which has

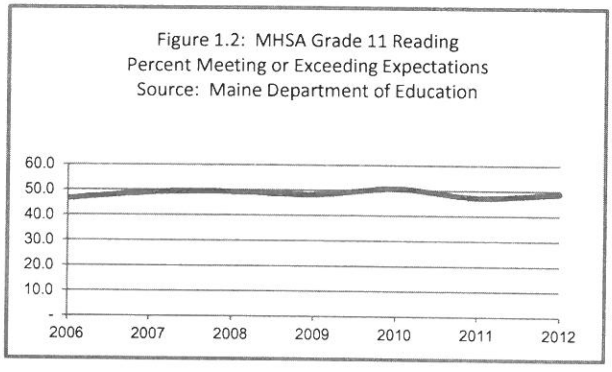
survived two administrations – one from each political party. Under NCLB, for the first time in the nation's history, the federal government reached into local classrooms and mandated student assessments aligned with each state's academic standards. NCLB placed significant emphasis on standardized testing results at all phases of public education, forcing sanctions on lower performing districts while annually raising the bar that identified adequately yearly progress (AYP) for schools. As originally written, NCLB required that by 2014 all schools must demonstrate that 100 percent of their students are able to meet or exceed standards in mathematics and reading in each grade level. Schools that fell short of the standard would be identified as "failing schools" regardless of the demographic makeup of the student population, or the resources available to meet student needs (United States Department of Education [USDOE], 2012).

Despite those efforts, and the increased focus on accountability for the past three decades, student performance – at least on the measures identified in the nation's accountability system – has remained flat (National Center for Education Statistics [NCES], 2012b). One of the more recent indicators fueling the United States' focus on accountability testing is the Programme for International Student Assessment (PISA) conducted by the Organization for Economic Cooperation and Development (OECD). Approximately 70 countries around the world participate in that standardized sampling of student performance. Since 2000, the PISA has been administered five times (2000, 2003, 2006, 2009, and 2012). In 2012, U.S. students scored slightly above the OECD average in reading and slightly below the average for mathematics and science, being eclipsed in all three areas by countries such as Finland, Japan, Korea, New Zealand, Canada, Estonia,

and Australia (OECD, 2012b).That outcome showed some slight positive movement, as United States students improved their score on all three tests between 2003 and 2012.

Maine schools, too, are challenged to show improvement in student performance, most notably by increasing scores on standardized testing. In 2006, Maine began administering the SAT to all third-year high school students in the state, with school level and statewide data reporting the number of students who meet standards defined by the Department of Education. As shown in Figure 1.1, less than one-half of Maine students have demonstrated proficiency on the mathematics portion of the SAT. Although statewide performance since beginning the use of the SAT improved steadily between 2006 and 2010, the most recent two-year trend indicates that performance has been on the decline. On the reading portion of the SAT, Maine students have demonstrated little growth over time (see Figure 1.2), with 2012 performance not markedly different from 2006. Similar to the results seen in Mathematics, fewer than half of Maine's students demonstrate proficiency on the reading portion of the SAT.





Achieving average outputs is not well regarded by the general public, or the political leadership, of the United States – especially when American schools record financial

inputs that are well above the international average. The OECD (2012a) reported that in 2009 only four countries (Luxembourg, Switzerland, Norway, and Austria) spent more than the United States ($12,550) in annual, equalized per-pupil expenditures for secondary education among 37 developed nations in the world. However, the OECD also reported that average per-pupil expenditures around the globe increased by more than 36 percent between 2000 and 2009, and the U.S. was one of only three countries (along with Iceland and Israel) in which per-pupil spending did not increase at the same pace as enrollment growth. That does not minimize the fact that the cost of public education in the United States has risen steadily over the past three decades. In their study of spending trends in U.S. education, Murray, Rueben, and Rosenberg (2007) state that, "Education expenditures are one of the largest spending areas for state and local governments, and per-pupil expenditures have been growing over time" (p. 325), while Hampel (2005) reports that, "Since 1965, American taxpayers have spent more than $321 billion in federal funds on K-12 public education, yet the average reading scores for 17-year-olds have not improved since the 1970s" (p.3). In adjusted dollars per student, the U.S. spent 17 percent more per pupil in 2009 than it did one decade earlier, and 85 percent more than two decades earlier (NCES, 2012a). In actual dollars spent per pupil, the U.S. average has increased 359 percent over a twenty-year period, from $2,307 in 1980 to $10,591 in 2009 (excluding debt service, transportation, capital outlay, and federal expenditures). Murray et al. (2007) found that much of the increase in spending over the past three decades may be attributed to increasing teacher salaries and efforts to reduce class size.

In Maine, which provided the sample schools for this study, per-pupil operating costs are reported by the Maine Department of Education (MDOE). For 2009, the statewide average for annual secondary school expenditures (excluding debt service, transportation, capital outlay, and federal expenditures) was $10,650 per pupil (MDOE, 2012), just $59 above the NCES-reported national average (NCES, 2012a). However, the United States Census Bureau (2013a) reported that a recent trend showed per-pupil spending on the decline in the state; while average per-pupil spending nationwide increased 15.6 percent from 2006-2011; Maine showed a slower rate of increase of slightly more than 8 percent. According to the Census Bureau (2013a), Maine ranked 20th among U.S. states in per-pupil spending in 2011, down from 14th in 2006, and actual spending dropped by 7 percent in the two-year period starting in 2009. Only Illinois showed a greater decline (Governing: The States and Localities, n.d.). Those data suggest that Maine schools, more so than those in the rest of the country, are attempting to hold the line on increasing school budgets. However, including debt service, transportation, and capital outlay, the Census Bureau reported Maine's per-pupil spending as $11,438 in 2011, still 8.3 percent higher than the national average. Thus, while student performance has remained relatively flat, expenditures have continued to rise.

Maine's district level policymakers are consistently expected to demonstrate that their students are performing at an acceptable level, and that their schools are operating at the lowest possible expenditure level. That balance is difficult to maintain for many districts. Schools are providing services well beyond fundamental academic instruction, including mental and physical health care, law enforcement services, and career preparation opportunities. As state revenue in Maine continues to fail to meet projections,

the responsibility for school funding continues to fall more and more on local taxpayers, and offerings beyond the core curriculum face elimination. That places local policymakers in unenviable positions, sandwiched between advocating for services for students, and responding to cries to minimize the impact on local taxes. Relief does not appear to be coming anytime soon. As state revenues continue to fall below necessary levels, the state continues to fall short of the mandate sent from the voters to fund 55 percent of the basic cost of education when they adopted LD1 in 2005. Maine defines the basic cost of education as those expenditures that fit within the state's identified "Essential Programs and Services" (EPS) model. In 2013-2014, the state contribution toward the EPS costs of K-12 public education was merely 45 percent (MDOE, 2012). That situation results in a greater impact on local taxes, greater scrutiny of school budgets, and difficulties for local policymakers intent on providing students with quality programming.

Whether or not one believes that a strong relationship exists between school resources and student performance, it is important to understand the context of school resource allocation in order to make more informed fiscal policy decisions. It is unclear if, and how, the level of data analysis in most research on school spending contributes to those discrepancies in relationships. As costs continue to rise, as the American economy struggles to recover from a long recession, and as international competition intensifies, U.S. schools will continue to be challenged to justify the level at which they are supported financially. In such an environment, it is critical for policymakers at the local level to have the information necessary to focus resources toward areas that most significantly impact student performance.

There has been a tremendous amount of research on resource allocation and school performance as measured by per-pupil expenditures and student test scores, respectively. A key premise of the present study was that the literature is lacking in research that delves deeper into the itemized allocation lines within school budgets, comparing programmatic or itemized expenditures in scientifically identified more efficient schools with similar expenditures at typical schools. Likewise, there is little qualitative research that has studied whether more efficient schools make allocation decisions in a different manner than typical schools. Picus (2000) confirmed that few studies have looked systematically at student-level resource allocation patterns because school-level and district-level data are much easier to obtain and analyze. "Picus concluded that while school-level data are attractive for a number of reasons, student-level data collections have the potential to be more cost-effective and more useful in improving our understanding of student learning" (Epps, 2010, p.55). In an attempt to increase the information available to local policymakers, this study considered expenditures at the programmatic level both for schools that have been scientifically-identified as being "more efficient" and for typical schools in Maine.

Significance of the Study

Monk and Roellke (1995) pointed out twenty years ago that, "There is growing interest within the United States in the use of indicators to hold local education agencies accountable for how they allocate resources and how they translate these resources into student outcomes" (p.493). In the two decades since, that interest has grown with American schools continuing to outspend their counterparts while U.S. students underperform their peers worldwide. "School finance policy and research increasingly is

focused on how education dollars are used as compared to the level of education funding and the equitable distribution of resources" (Odden, et al., 2008, p.381). Still, much of the research to date has focused purely on a school's or district's total per-pupil expenditures and student outcomes as measured on standardized tests – two relatively simple sets of statistics to obtain and analyze. This study was unique in that it considered a set of scientifically identified more efficient schools in one rural state, Maine, and compared them with schools that are both higher performing, but not more efficient, and those that are neither higher performing nor more efficient. This study also attempted to understand where and how resources are allocated on a more granular level. Total per- pupil expenditures was the starting point, rather than the end point, of data analysis. Holmlund, McNally, Viarengo, & Stockholms (2010) point out that:

> Whether increasing school resources has an effect on educational outcomes has been long-debated and hotly contested. The answer to this question is extremely policy relevant because increasing (or reducing) school expenditure is one of the key levers open to policymakers to try to influence educational standards. (p. 1161)

By digging deeper into the data to examine where more efficient schools are focusing their resources, this study expanded the information available to local policymakers and may provide generalizable findings to schools beyond Maine that face similar challenges.

CHAPTER II: REVIEW OF THE LITERATURE

This study examined resource allocation at public high schools identified by the Maine Education Policy Research Institute (MEPRI) as being more efficient (Silvernail & Stump, 2012) to determine if those schools allocate resources differently than typical schools. By MEPRI's standards, more efficient schools are those that "exhibit higher student academic performance *and* a higher return on spending, as well as achieving both of these standards regardless of the economic and social conditions found in the community" (p.ii). This study also sought to determine if different resource allocation models vary in how they reveal differences in expenditures between more efficient schools and typical schools.

As a first step toward analyzing the resource allocation policies and practices of Maine's more efficient schools, the literature pertaining to the impact of resource allocation on student performance was reviewed, followed by a review of the literature regarding methods by which schools allocate and report resources.

Research Questions

This study was designed to answer the following research questions:

1. Do Maine's more efficient public high schools expend fiscal resources differently than the typical school?
2. Do different resource allocation models vary in how they reveal differences in expenditures between more efficient schools and typical schools?
3. Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are those practices?

Resource Allocation and Student Performance

With the national focus on student performance and fiscal impact, it is not surprising that many studies have sought to determine the relationship between school funding and academic achievement. Hanushek's work from the late 1980s to the present day remains some of the most cited research on the relationship between school expenditures and student outcomes. Looking at more than 100 studies of the effects of different inputs on student performance, Hanushek (1989, 1996) found that approximately one-half indicated some positive correlation, while the other one-half found no correlation, or a negative correlation (Chaudhary, 2007). Hanushek contends, time and time again, (e.g., 1989, 1996, 1997, 1999, and 2005) that school expenditures are not an important determinant of student outcomes. Even with one-half of the reports in his 1989 and 1996 studies indicating a positive relationship, in Hanushek's 1997 update he reiterates that, "there is no strong relationship between variations in school resources and student performance" (p. 148).

Holmlund et al. (2010) point out that Hanushek's proclamation is contradicted by several well-known, high-quality studies – most notably the Tennessee Student/Teacher Achievement Ratio (STAR) class size report (Word, 1990), in which the authors report that school resources, through the reduction of class sizes, do have a positive and lasting correlation with student learning, with the greatest impact on students in early elementary school. "There was a significant positive small-class effect for both reading and math at the end of kindergarten, the effect increased at Grade 1, then declined in Grades 2 and 3" (Word, 1990, p. 17).

Hanushek's (2003) response to the STAR study highlights the great divide, and emotional fervor, that remains on this subject:

> The one limited and flawed experiment in Tennessee cannot be taken as providing the definitive evidence needed for policy changes that cost billions of dollars annually. At best it provides evidence about the potential impact of very large changes in class size applied to kindergarten students, and there is direct evidence that these findings do not generalize to other grades and other situations. (p. 89)

In an earlier review of the study, Hanushek (1999) stated that the researchers were determined to show a positive correlation between smaller class sizes and student achievement, and that they overlooked other factors that may have contributed to students in smaller class sizes having higher test scores over the four-year study (such as the quality of teachers and his claim that a large percentage of the students who started out in kindergarten moved out of the school and were therefore not in the cohort that was assessed in later years). "Teacher expectations and reactions to the experiment itself could also enter. Everybody in the school knows that the experiment is happening, and many are likely to have prior views about the efficacy of smaller classes" (p. 153).

Greenwald, Hedges, and Laine (1996) take up the argument with Hanushek, stating that:

> The question of allocation of resources to schools has indeed been marked by controversy, with various factions defending entrenched positions. All too often, research evidence has been used as part of the political rhetoric with little regard for how it might aid in the comprehension of difficult

problems facing our nation's schools. Hanushek's writings over the last two decades leave little doubt as to his position. (p. 411)

During her review of the literature, Chaudhary (2007) found "there is no consensus in the education literature on the causal link between increased expenditures and improved student performance due to confounding factors such as family income that might be correlated with both district expenditures and student performance" (p. 90). Searching for a way to disentangle the causal effect of spending on student outcomes, Chaudhary conducted a statewide analysis of Michigan's public schools following the implementation of a statewide school finance reform known as "Proposal A" and noticed that districts with increased levels of spending tended to have higher teacher salaries, lower class sizes, and improved student performance. Chaudhary states: "Following Proposal A class size decreased by 4.6% on average, and there is a similar pattern of improvement in teacher salaries that increased by 6.6%. In general, higher enrollments lead to bigger classes and lower salaries" (p. 96). In the end, Chaudhary concluded there was a causal relationship between spending and student performance on standardized tests, but only at the earliest level of testing. "The coefficients on operation expenditures per-pupil suggest that a 10% increase in spending would increase 4th grade scaled scores by 1.2 points, which is one-tenth of a standard deviation" (p.98). The author is cautious about the results: "Increased expenditures appear to be beneficial only for 4th grade test scores, which suggest that either the causal relationship varies by grade or that schools allocated varying expenditures per-pupil to different grade levels" (p. 98).

Chaudhary's work served as an affirmation of that conducted by Steele, Vignoles, and Jenkins (2007) that same year. Steele, et al. asked whether an increase in per pupil-

expenditures, or a lower pupil-teacher ratio, is a viable way to improve student performance. Seeking to provide empirical evidence to assist policymakers in the allocation of financial resources, Steele and her colleagues reiterate that there is a great deal of contradictory literature analyzing the correlation between school resources and student performance, and between class size and student performance. "One possible explanation for finding a weak relationship between classroom and school resourcing levels and pupils' achievement is that schools are inefficient, lacking the competitive pressures that are required to make them use resources more effectively" (Steele et al., p. 802). The authors contend that issues of endogeneity have impacted studies contemplating the relationship of school resources and student achievement, where schools that serve more students from lower socioeconomic homes receive a greater influx of resources. In the study, Steele's team employed a simultaneous equation model to adjust for endogeneity, examining the effect of school resources on student performance in English, mathematics, and science in public schools in the United Kingdom. The researchers considered three resource variables at the school level: (1) per-pupil expenditure adjusted for regional cost of living factors; (2) student/teacher ratio; and (3) student/non-teaching staff ratio. The study then considered student performance on standardized tests in mathematics, science, and English, finding that 14-year old students at schools with greater resources performed better in mathematics and science, with no significant difference in English attainment. "From a policy perspective, this suggests that better-funded schools, and those with lower pupil-teacher ratios, have higher pupil attainment than schools with lower levels of resources" (Steele et al., 2007, p. 816).

Looking at a single school district in California, Jimenez-Castellanos (2010) conducted a sequential mixed-methods study that supported the findings of Chaudhary (2007) and Steele, et al. (2007), documenting a clear positive correlation between resources and student achievement. Most notably, higher teacher salaries and newer facilities with fewer portable classrooms were prevalent in schools with better student performance. Jimenez-Castellanos contends that the results support the hypothesis that a school's "resource package" promotes (or hinders) high quality instruction and positive school culture, thereby influencing student performance. "The resource variables positively correlated to higher school achievement are: higher teacher salaries, higher attendance rates, newer schools, more multi-purpose space per pupil and fewer portable classrooms" (Jimenez-Castellanos, 2010, p. 358).

The United States and the United Kingdom are not alone in the challenge to understand resource allocation as a strategy for operating more efficient schools. Haelermans, DeWitte and Blank (2012) studied the need for schools in the Netherlands to spend resources efficiently due to an economic downturn combined with increased student needs and accountability measures. "Tightening budget constraints and increasing demands force schools to spend resources in terms of employees, management and material in the most productive way" (p. 575). Haelermans and her colleagues identified the increasing demands as greater programmatic needs (e.g. counseling and extra-curricular activities), facilities costs, and support structures for a growing number of students from low-income families. At the same time, an anticipated Dutch teacher shortage has begun to develop due to four factors: the diminishment of the social status of the profession; the increasingly female-dominated nature of the profession; the aging –

and resultant outflow – of teachers in the baby boomers cohort; and the need for more teachers due to the demand for individual counseling and instruction brought about by increasing numbers of students from lower socioeconomic status. Haelermans et al. (2012) point out that "as schools differ on resources, student population, location, etc., the optimal input mix will be different for every school" (p. 582).

Defining school productivity as a measure of student performance on standardized examinations and student achievement each year of secondary schooling, Haelermans et al., through a complex collection and analysis of data, set out to determine a technical efficiency rating for each school. This rating indicates the percentage by which each school could improve its outputs (productivity) by making better use of its existing resources. For the study, school resources were categorized as (1) management personnel, (2) teaching personnel, (3) supporting personnel and (4) material supplies, while measures of educational production included the average student central examination grades per school and the average student achievement each year during secondary education. Analyzing the data for each of 448 secondary schools using a "Corrected Ordinary Least Squares" formula, each school was assigned an efficiency rating for each of six years from 2002-2007. The average efficiency score for the sample group of 448 secondary schools in Netherland was 78 percent, meaning that the average school could improve educational performance by more than 20 percent if it allocated its resources more efficiently. Interestingly, the study identified a slight overutilization of teachers and instructional materials, and an underutilization of management and support staff. For every 131 secondary teachers employed in Netherlands, the authors argue that the same student performance results could be gained by hiring 130 teachers, and for every 90

school administrators, hiring 91 would be more appropriate. According to the authors, that did not indicate a high level of inefficiency for the schools studied, but given the impact over an entire nation, the authors contend that greater efficiency could be meaningful.

Although the main school input in terms of cost is teacher salaries, Holmlund et al. (2010) proposed using total per pupil expenditure as the base financial measure of school allocations, since resources may be spent in a variety of ways. Reviewing data from more than 15,000 schools in the U.K., Holmlund et al. considered standardized test scores and expenditure per pupil as their measures of student performance and school resources, respectively, to calculate an educational production function for each school. Their findings reaffirmed the results of the STAR report (Word, 1990), stating that, "school expenditure has a consistently positive and significant effect on all national tests taken at the end of primary school and has a higher effect for students who are economically disadvantaged" (Holmlund et al., 2010, p. 1161).

Similarly, Pan, Rudo, Schneider, & Smith-Hansen (2003) reported on a study conducted by the Southwest Educational Development Laboratory (SEDL) which found a strong relationship between resource allocation and student success. The SEDL study examined resource allocation data from every independent school district in Arkansas, Louisiana, New Mexico, and Texas, further selecting twelve districts from the larger sample that showed steady improvement in student performance. National, state, and local data were collected from fiscal, staffing, and demographic records and information, while qualitative data came from interviews with superintendents and other key educational policymakers as well as administrative focus groups and teacher surveys.

Both sets of data were analyzed using multivariate models, ANOVAs, and regression analysis.

In stark contrast to the studies of Hanushek, the SEDL study drew a strong positive correlation between resources and educational outcomes:

> The findings from the research demonstrated a strong relationship between resources and student success. The results indicated that allocating resources within select areas and for certain practices might make a significant impact on student performance. Both the level of resources and their explicit allocation seemed to affect educational outcomes. (Pan et al., 2003, p. 79)

One explanation for this contrast is that the SEDL study drilled down deeper into the expenditure data and considered the specific areas being funded, whereas many of the studies that found no relationship between spending and student performance have looked only at the total per pupil expenditure in a school. Hanushek (1997) agrees, at least in theory, "In reality, studies involving per-pupil expenditure tend to be the lowest quality studies, and there is substantial reason to believe that even the reported results overstate the true effect of added expenditure" (p. 144).

Yeh (2007) supports Steele's statement that the relationship between spending and achievement in schools is still in question, referencing Hanushek's meta-analysis studies (1986, 1989, and 1997) that suggest only a weak relationship between educational spending and student achievement. Yeh then points to the contradicting work of Greenwald, Hedges, and Laine (1996) that re-analyzed Hanushek's meta-analysis. Greenwald et al. found a positive correlation between educational resource inputs and

student outcomes. "Our findings demonstrate that money, and the resources those dollars buy, do matter to the quality of a child's education" (p.415). Similarly, contrasting studies are cited for accountability measures, with Amrein and Berliner (2002) finding no correlation between high-stakes testing and student achievement, directly contradicting the findings of Braun (2004) and Rosenshine (2003). However, numerous researchers have provided evidence that specific programs, when targeted for greater resource allocation, provide similar results. One example of this is the work of Springer, Houck, Ceperley, and Hange (2007), who studied revenue generation and resource allocation associated with the implementation of smaller learning communities in three high schools in one district in Tennessee. The authors identified individual components that make up a particular program – in this case smaller learning communities – to ascertain the total overall cost of implementation. Data-driven analysis helped the district determine proper resource allocation for implementing this new program, and ongoing review of data assisted in mid-course corrections which led to improved academic performance and overall program success. In the study, four high schools were provided between $479 and $1000 per pupil, per year to implement smaller learning communities, with the majority of funding providing additional staff and professional development. "District leaders worked to align spending patterns and smaller learning community development with improved academic performance, attendance, behavior, matriculation, parent and community involvement, and teacher, parent, and student attitudes and satisfaction" (p. 464).

Stiefel, Bel Hadj Amor, & Schwartz (2005) argue that the ranking of public schools or placing them into categories of "best" and "worst" performers for the purpose

of presenting rewards or sanctions has become a feature of the educational landscape. "Interestingly, while these lists of best and worst schools differ in their criteria, data, and methodology, none explicitly considers the efficiency with which these public schools use their resources" (Stiefel et al., 2005, p. 83). Stiefel's group presents a quantitative technique to rank schools according to performance and resources, identified as an Education Production Function (EPF). "This method takes into account the inputs that produce education (students and resources, primarily)" (Stiefel et al., 2005, p. 92). The EPF is determined using regression techniques, with a measure of output as the dependent variable and inputs as the independent variables. Looking at several hundred schools in New York City over a six-year timespan, Stiefel et al. point out that the list of "worst schools" does not always match with the list of "highly inefficient" schools. The research showed that, indeed, some of the high performing schools were not highly efficient, in that they had "especially generous budgets" (p. 83), while low-performing schools could be quite efficient if they had few resources to invest.

One possible explanation for the findings of Stiefel et al. is the imprecision of resource allocation analysis. As in many other studies, per-pupil expenditures were used to gauge the input of fiscal resources, rather than delving further into the types of programs and services in which each school chose to invest – or those programs and services that demanded more resources because of the student population in the school.

In summary, the research comparing academic performance to educational expenditures has produced a wide range of results. Hampel (2005) states:

> There is a rich body of literature studying the relationship between resources spent on education and educational outcomes such as

> performance on achievement tests, graduation rates, and other assessment indicators. Since there are several hundreds of studies investigating this topic, it is quite impossible to provide an exhaustive review of the literature, and any overview could not be comprehensive. (p. 57)

Not only is an exhaustive review impractical, drawing any concrete conclusions from the literature is similarly problematic. Those who agree with the Greenwald camp claim a causal relationship may be drawn, especially for students at particular levels or in specific circumstances. Those in Hanushek's camp argue that no clearly defined positive relationship can be declared. Yet, in more recent years even Hanushek (2003) finds that some of the literature presents data that support a correlation between spending and performance in specific instances:

> First, it does not mean that money and resources never matter. There clearly are situations where small classes or added resources have an impact. It is just that no good description of when and where these situations occur is available, so broad resource policies such as those legislated from central governments may hit some good uses but also hit bad uses that generally lead to offsetting outcomes. (p. 89)

Because each study is conducted in a unique setting and considers unique variables, it is not unexpected that varying results would be produced. It appears from the research review reported here that researchers considering program-specific expenditures are more likely to identify a positive relationship between spending and performance. However, in order to investigate resource allocation at the programmatic level per pupil, one must first determine how – or even if – a school's fiscal allocations can be

categorized in a manner that allows for deeper analysis of fiscal policies compared to student performance. In the following section, research regarding school district allocation and reporting of expenditures are explored further.

Resource Allocation and Reporting

In the United States, the call for greater efficiency – increasing student output while minimizing resource input – continues to dominate the conversation about public schools. Monk and Roellke (1995) propose a set of indicators comprised of a combination of inputs (resources) and outputs (student performance), resulting in an accountability system that involves consequences of some magnitude. When considering inputs, they point out that resources can enter schools at any level of decisionmaking – the foremost for American schools being federal, state and local tax revenues. Central to their findings, though, is the premise that an accountability system should not be based solely on indicators that trigger rewards or punishments; rather, those indicators should be used to inform and evaluate a situation, and lead to greater communication and assessment of each program. "The key to successful implementation lies in the use of the indicator results as the basis of discussion and perhaps negotiation between the state or monitoring agency and local levels. A serious mistake will have been made if indicators of the type we describe here become rigid measures of performance attached to sanctions and rewards" (Monk & Roellke, 1995, p. 498). Determining which indicators to use - and which programs might best address those indicators, is the question that local districts must answer.

Although it is most convenient to consider the per-pupil expenditure comparisons between schools, districts, states, and even nations, it is more instructive to consider

resource allocation decisions at the programmatic level to better understand how schools may redistribute resources to more significantly impact student outcomes.

Several models for analyzing expenditures are available. Six models are discussed below, with a description of their usefulness for this research. The models reviewed are:

1. Odden, Archibald, Fermanich, & Gross (2003) school-level expenditure structure
2. Hampel (2005) Return on Spending Index
3. Consortium for Policy Research in Education (Odden, 2008) expenditure reporting structure
4. National Center for Education Statistics (NCES) object code report
5. Maine Department of Education (MDOE) warrant article report
6. Roza and Swartz (2007) School Spending Profile (RS)

Odden, Archibald, Fermanich, & Gross (2003) developed a school-level expenditure structure to advance school-finance research conducted earlier by Odden & Busch (1997). Odden et al. (2003) began with the premise that the governmental accounting system for school expenditures was not helpful in analyzing the differences between schools. "This (governmentally mandated) accounting structure showed that expenditure functions by function were remarkably stable over time and across states and districts" (p. 323), and therefore provided little helpful information. Odden et al. (2003) found that the governmental response to such criticism was to begin categorizing expenditures by "programs", such as regular education, special education, and bilingual education. Many of those program definitions emerged as a result of federal, state, and

local governments' need to ensure that schools allocated the resources to serve the intended programs for which the money had been granted.

Odden's 2003 team stated, "One persistent concern in public education is a fiscal reporting system that helps education leaders and policymakers at school, district, state, and federal levels make better decisions about the programmatic and instructional uses of the education dollar" (p. 323). Building upon work done by Chambers and Parrish in 1994 to develop a resource cost model, as well as that of Fowler (2001), who worked to improve the school-resource reporting system as the director of the National Center for Education Statistics' school finance division, Odden et al. (2003) set about developing a system that "reports school-level resource use and indicates as much as possible about the educational strategy those resource-use practices reflect" (p. 325).

The Odden et al. (2003) model categorizes expenditures by elements that reflect the school's current thinking about instructional strategies and resource allocation, identifying nine expenditure elements – seven of which are categorized as instructional and two of which are non-instructional. The seven instructional elements are:

1. Core academic teachers: At the high-school level, which will be the focus of this study, the group includes ELA, mathematics, science, social studies, and special education teachers who teach a specific subject matter.
2. Specialist and elective teachers: The category includes teachers of art, music, and physical education, foreign language, vocational education, library/media specialists, and others.

3. Extra help: Tutors, special educators who in resource rooms, alternative education and extended day or summer school programs are included in this element.
4. Professional development: Trainers, coaches, materials, equipment, tuition, travel, and other costs for training for the school's staff comprise the category.
5. Non-classroom instructional staff: The group includes substitute teachers, instructional aides, and program coordinators.
6. Instructional materials and equipment: Included here are books, supplies, equipment, hardware and software for all instructional programs.
7. Student support: The category includes school-based support staff such as counselors, nurses, social workers, and psychologists, as well as all co-curricular and extra-curricular expenditures.

The two non-instructional expenditure elements are:

8. Administration: The category includes all expenditures for the office of the principal and assistant principal, including clerical staff, supplies, and equipment.
9. Operations and maintenance: All costs for staff, supplies and equipment for custodial services, food services, and security, as well as all utilities and maintenance costs are included in this category.

To provide context to assist with identifying a school's priorities, Odden et al. developed a list of resource indicators to be combined with the expenditure elements in a

single report. The resource indicators include: student enrollment; percentage of students eligible for free- or reduced-price lunch; percentage of special education students; percentage of ELL students; per-pupil expenditures; per-teacher professional development expenditures; length of instructional day; length of class periods; length of core class periods; core class size, non-core class size; and percentage of core teachers.

In a study of two high schools in the Midwestern U.S., Odden et al. found that the expenditure structure could identify differences in school-level priorities. Specifically, the study revealed differences in spending between a traditional high school and one that employed a school-within-a-school strategy, identifying areas of disproportionate spending between the two schools. The Odden model categorizes expenditures in a manner so similar to that provided by the Maine Department of Education chart of accounts that it was decided that it would have been repetitive to make use of the model in this study. However, if this study were to be conducted in a state without a standard chart of accounts, or across two or more states with varying charts of accounts, the Odden model might be given serious consideration, as it would provide a researcher with a framework for categorizing costs.

Hampel (2005) introduces another framework for reporting resource allocation designed to provide diagnostic information about the educational return on resources spent by school districts. Developed by Standard and Poor's School Evaluation Services (SPSES), the "Return on Spending Index" (RoSI) provides a single score to indicate a school's return on investment. To determine the RoSI for a school, a researcher first identifies a performance indicator to be considered, such as the results of a specific standardized test, graduation rate, or retention rate. The researcher then selects an

appropriate spending variable. SPSES recommends operating expenditures with capital improvement and transportation expenses be removed. The costs are standardized by applying a geographic cost adjustment to control for regional differences. The RoSI is determined by dividing the performance indicator by the level of spending, yielding a productivity indicator. The productivity indicator provides one broad score for each school. Although the model may be helpful if multiple scores are provided based on a corresponding number of expenditure accounts or cost centers, the use of total per-pupil expenditure as the sole resource variable results in a much more summative view of each school's efficiency than was deemed to be helpful in this study.

In a third model, the Consortium for Policy Research in Education (CPRE) developed an expenditure reporting structure that identifies spending according to instructional functions (e.g. core instruction, specialist instruction, professional development) in an attempt to reveal how education dollars were used within each instructional category (Odden et al., 2008). Odden and his colleagues applied that structure in an analysis of expenditures and performance across eleven public school districts in Michigan, finding that each of the schools made improvements in student achievement, but with a wide variation in the level and targeted distribution of resources. One of the constants that the authors found surprising was the commitment of funds in each district toward professional development. The indication from the authors was that professional development, especially once a school had been in reform mode for five or six years, was an unnecessary cost, yet their own research found it to be the most consistently targeted allocation area within each of the schools. That research was

instructive for this study, as professional development was one of the areas to be studied in at least one of the allocation models applied to the data.

One particularly useful model for analyzing the differences in resource allocation between more efficient schools and typical schools is one developed by the National Center for Education Statistics (NCES). NCES is the federal entity responsible for collecting, analyzing, and reporting education-related data in the United States (Allison, et. al., 2009). Fulfilling a congressional mandate, NCES collects financial data from each state, requiring a uniform reporting standard with guidance from the Governmental Accounting Standards Board (GASB). Each state has different reporting mechanisms and tools, though the accounting methods used must be capable of producing financial reports that conform to the GASB standards.

Using the NCES method of accounting, school districts categorize costs using a system of coding that identifies each expenditure by (1) fund, (2) program, (3) function, (4) object, and (5) cost center. The *funding* code indicates the fund from which the expenditure will be made and includes the general operating fund, special revenue fund, capital project fund, debt service funds, and permanent funds. The program code indicates the specific area within the budget toward which funds are targeted for a common purpose. Examples of program categories include regular elementary education, regular secondary education, vocational and technical education, and adult education, among others. The *function* code describes the activity for which a service or item is purchased. The functions of a school district are classified into five broad areas: instruction; support services; non-instructional operations; facilities acquisition; and

construction and debt service. The *object* code is a three-digit identifier that describes the commodity or service obtained. There are nine object categories for public schools:

100 Salaries – The gross amounts paid to all school employees; permanent, temporary, and substitute.

200 Benefits – Amounts paid by the district on behalf of employees for fringe benefits (e.g., health insurance, social security, retirement).

300 Purchased Professional Services – Expenditures for services provided by professionals not in the employ of the district: doctors, engineers, auditors, consultants, and examiners, for examples.

400 Purchased Property Services – Costs to operate, repair, maintain, and rent property owned or used by the district.

500 Other Purchased Services – Amounts paid for services by organizations or personnel not employed by the district and separate from professional, technical, or property services not included in 300 and 400 account code categories.

600 Supplies – Expenditures for items that are consumed or worn out – or lose their identity through incorporation into more complex units or substances (to distinguish between a supply item and an equipment item).

700 Property – Amounts paid to acquire or improve capital assets, including land, existing buildings, infrastructure, and equipment.

800 Debt Service and Miscellaneous – Amounts paid for goods and services no classified in codes 100-700.

900 Other Items – Transactions that are not classified as expenditures but require control and reporting. Those might include fund transfers from one district fund to another, and discounts on bond issuances.

Each object category is further divided into multiple sub-categories, allowing the district to track spending on a granular level. For example, object category 100, Salaries, is divided into twenty-three subcategories, such as salaries paid to teachers, salaries paid to instructional aides, salaries paid to substitute teachers, and salaries for overtime.

The final code in the NCES format identifies the cost center from which the expenditure is made. That may be a specific school, the superintendent's office, the transportation garage, or any other of a number of isolated cost centers within the school budget.

Employing the NCES accounting model, even very large public school districts can easily identify annual expenditures for items as specific as bottled gas purchased for heating the transportation garage, or the amount spent on printer cartridges at a particular elementary school. Because of the specificity of expenditure identification provided by this model, and because every public school district in the country must account for its expenditures using this model, it was determined that the model would serve as a useful tool for comparing resource allocation between the schools in this study.

A second potentially useful model for analyzing expenditures is the Maine Department of Education's (MDOE) chart of accounts. In that system, every school district in Maine reports budgets and expenditures using an 11-item chart that allows for easy comparison between districts. All expenditure items are first coded according to the

NCES model and then placed into one of 11 categories according to a chart provided by the MDOE. The cost categories have come to be known as each district's "warrant articles," because they are the categories by which each school district presents the budget for approval each year. The warrant articles consist of:

1. Regular Instruction – This covers salaries and benefits for regular education teachers and support personnel, as well as classroom supplies and equipment, books, audio-visual supplies, and repairs.
2. Special Education - For salaries and benefits for special education teachers and support personnel, as well as classroom supplies and equipment, out-of-district placements, and professional services.
3. Career and Technical Education – Covers salaries, benefits, and instructional supplies for cooperative education.
4. Other Instruction – Provides salaries and benefits for Gifted & Talented, English Language Learners, Alternative Education, Summer School, and Interscholastic Athletics and Activities. Includes supplies, dues, fees, and professional contracts.
5. Student and Staff Support – Covers salaries and benefits for Guidance, Health Services, Curriculum, Professional Development, Libraries, Academic Testing, and Technology. It includes professional services, travel, training, books and periodicals, and supplies.
6. System Administration – Provides salaries and benefits for offices of the superintendent, finance, and development. Includes property and liability

insurances, advertising, dues and fees, legal fees, auditing expenses, supplies, and lines for boards of school directors.

7. School Administration – Covers salaries and benefits for principals, assistant principals, school secretaries. Includes equipment (copiers, etc.) and repairs, supplies, dues and fees, contracted services.
8. Transportation and Buses - For salaries and benefits for drivers, bus aides, mechanics, and supervisors. Principal and interest payments for bus purchases and leases, fuel costs, insurance, equipment and supplies.
9. Facilities Maintenance – Covers salaries and benefits for custodial and maintenance workers and supervisory staff. Includes non-labor costs for building repairs and maintenance, contracted services, and supplies.
10. Debt Service and Other Commitments – Covers principal and interest payments for capital improvement bonds.
11. All Other Expenditures – In most districts, covers the district's contribution toward the school nutrition program.

By collecting data from each school using a standardized format, the state can track costs and report them in a uniform manner. School leaders and citizens, as well, can look to the data for quick comparisons between districts, or compare their districts against the state average. However, Maine school leaders will confirm that even with a standardized reporting system, individual variances occur, as schools do not always agree on the placement of items within the categories.

In Maine, the chart of accounts is particularly important because of the way in which school budgets are approved. There are several different types of organizational

units allowed for Maine schools, from single-town "municipal districts" to multi-town "regional school units" to multi-district "school unions," and the ever-changing "alternative organizational structures." Each of those organizational units must present its budget according to the chart of accounts, with public debate and, in many cases, voting on each warrant article.

Because each school district being studied must report expenditures using that chart of accounts, and because this study examined the differences in resource allocation between schools that are identified as being more efficient and those that are typical, the data presented through the warrant articles provided an important step in the analysis of data.

For allocation models that allow for the comparison of specific types of expenditures (e.g. academic assistance for non-special education students, professional development for teachers), one must move away from the governmental format of reporting and look to more descriptive models. Roza and Swartz (2007) propose a school spending profile as a way to report and compare school resource allocation. The difficulty for school leaders, they point out, is not a lack of data or accounting systems. Rather, it is the plethora of both data and reporting systems that overwhelm educators, as well as those others wanting to hold schools accountable. Policymakers want to know how their allocations or resources are impacting student learning, and how allocation in one school or district differs, or results in different student outcomes, than that of another school or district. Roza and Swartz argue that school spending data must be organized in such a way that allows district leaders to gauge spending at each school in a district, make spending transparent for all groups, compare spending across different types of schools,

and evaluate spending patterns in the context of stated district strategies. Studying schools in Denver, the authors found that nearly every district used a district-wide average salary figure in school budgets, regardless of the number of teachers they had near the high end of the pay scale. In an earlier study, Roza, Hill, Sclafani, and Speakman (2004) had discovered that the distribution of salaries could be shifted by as much as 30 percent, suggesting that the use of real salary figures, rather than averaging, would provide a more accurate picture of school spending. In the Roza and Swartz (2007) Denver study, the school spending reports did not take into account central district accounts as it was considered extremely difficult to determine how much of each district account should be attributed to one school's spending report. Roza and Swartz propose a report that takes into account real salary figures and each school's share of central district spending, yet they recognize that further complications still make comparisons difficult. "Student demographics, and therefore needs, are unique at each site. It is critical to take into account student need in spending comparisons" (p. 74). By separating out the data for student needs, a school spending profile may be developed that allows for comparisons between schools with very different student needs.

Roza and Swartz (2007) propose that schools develop a spending profile by selecting categories that reflect their student demographics and funding streams. For the Denver study, the profile considered four categories of spending: (1) Non-categorical, (2) Poverty, (3) Limited English Proficient, and (4) Gifted. The researchers collected spending data for each school, coded it as one of the four categories and determined the district per-pupil average within each category. Once the system-wide average was known, the predicted expense for each school was calculated by simply multiplying the

system per-pupil average by the number of students in each school to show if a school was spending more or less than anticipated. Reporting school expenditures as a percentage of the system-wide average within each category revealed how schools were allocating resources differently.

Roza and Swartz (2007) declare that, "Most district policymakers, despite extensive financial reporting requirements, lack the financial tools necessary to make meaningful spending comparisons" (p.69). The school spending profile they suggest was created to compare resource allocation between different schools within one large district (Denver Public Schools), but the model was used in the present study in comparing schools from different Maine districts. Because the model adjusts for demographic differences, and because of the comparatively small size of Maine school districts, analyzing local school expenditures through a spending profile such as the one suggested by Roza and Swartz (2007) was used in this study to provide meaningful comparisons. The NCES codes allowed for the grouping of expenditures of a similar type into preferred categories for further study.

Roza's and Swartz's (2007) contention that school finance data must be reported in ways that allow for meaningful comparisons among schools is supported by the work of Odden, et al., (2008) who point out in their Michigan study that "school finance policy and research increasingly is focused on how education dollars are used as compared to the level of education funding and the equitable distribution of resources" (p. 381). Contributing to the movement are the modest improvements in student results despite significant increase in per-pupil investment, and the No Child Left Behind act and other standards-based reform movements.

In summary, much of the research seeking to quantify the relationship between resource allocation and student performance considers district-level or school-level per-pupil expenditures as the sole financial measure. However, there is a call for a more granular review of resource allocation:

> Per-student expenditures are an extremely poor measure of education resources applied to students' learning. How money is spent is far more important than how much is spent. Moreover, the accounting of expenditures has become so complicated in recent years that it is difficult to focus on its classroom applications. The many services provided by schools in response to the demands of a changing society require increasing percentages of school budgets without any concomitant return in student achievement. (Smith, Scoll, & Link, 1996, p. 23)

Therefore, it is spending at the programmatic level that should be investigated more thoroughly, as opposed to overall school or district expenditure levels, or even overall per-pupil expenditures. To do that, one must determine effective methods for identifying expenditure elements. The literature on financial reporting indicates that there are multiple formats for determining where schools focus their resources. Based on a review of available resource allocation models, three surfaced as potentially useful in analyzing resource allocation between a set of more efficient schools and a set of typical schools:

1. The Maine Department of Education warrant article model
2. The National Center for Education Statistics account code model
3. The Roza and Swartz school spending profile.

The Maine Department of Education requires all school units in the state to report expenditures using the NCES accounting codes which are then further sorted into one of 11 categories, which provided the first set of comparative data at the district level. Second, the NCES coding allowed for a more granular examination of the data at the school and object level. Finally, Roza and Swartz (2007) present a school spending profile that allowed the researcher to identify the cost centers or expenditure areas to be studied, comparing each school's per-pupil expenditure within each category to the average for the data set and thereby drawing conclusions about each school's expenditure focus.

Summary of the Review of the Literature

Much of the research around education expenditures and student performance is mixed. While Hanushek and others are adamant that the level to which a school spends money has little to no relationship to student performance, other researchers – such as Chaudhary (2007) and Steele, Vignoles, & Jenkins (2007) – believe expenditures do matter. Hanushek (1997) states: "There is no strong or consistent relationship between school resources and student performance. In other words, there is little reason to be confident that simply adding more resources to schools as currently constituted will yield performance gains among students" (p. 148). To which Greenwald et al. (1996) respond: "While disagreements persist, scholarly debate should not obscure the fact that the best evidence, upon close inspection and the application of appropriate statistical methodology demonstrates that student achievement is related to resource availability" (p. 411).

All that is clear from the research is that the relationship between per-pupil spending and academic outcomes is unclear. Therefore, the issue may not be simply the amount of money that is spent, but how it is spent. Rather than looking solely at per-pupil spending, a more in-depth analysis of where schools allocate their resources is necessary. "Picus concluded that while school-level data are attractive for a number of reasons, student-level data collections have the potential to be more cost-effective and more useful in improving our understanding of student learning" (Epps, 2010, p.55). Making use of each of those models, this study looked to a unique set of scientifically identified more-efficient high schools in Maine to see what lessons might be learned from their resource allocation practices, considering expenditures on a more granular level in an attempt to determine if more efficient high schools allocate resources differently than typical schools.

CHAPTER III: METHODOLOGY

Purpose Statement

The main purpose of this study was to determine if resource allocation practices of Maine's more efficient public schools – defined by the Maine Educational Policy Research Institute (MEPRI) as those that are both higher performing and have lower per pupil expenditures than a scientifically determined comparison set (Silvernail & Stump, 2012) – differ from those of typical schools. Specifically, do more efficient schools allocate resources to programs differently than those that are not identified as more efficient, and do more efficient schools employ decisionmaking practices regarding resource allocation that differ from typical schools with similar demographics? The intent was to examine expenditures at the district, school, program, and object level in an attempt to provide an in-depth analysis of resource allocation in Maine's more efficient schools as compared to typical schools. Additionally, this study employed three expenditure comparison models to determine if they vary in the way in which they reveal differences in spending between the two types of schools.

Maine's More Efficient Schools

While the debate rages over the appropriate level of funding for public schools and the implementation of accountability systems that rate schools, teachers, and administrators on student performance measures, some Maine schools have been found to demonstrate better than average effectiveness with lower than average expenditures when compared with similar schools.

This project examined a set of public high schools that have been identified by the Maine Education Policy Research Institute (MEPRI) as "more efficient schools"

(Silvernail and Stump, 2012). In the MEPRI study, the researchers examined student assessment data and per-pupil expenditures over a three-year period (2008, 2009, 2010) for more than 75 percent of Maine's public schools, defining "higher performing schools" as those that met each of the following criteria:

1. Achieving higher than average student performance on statewide achievement tests;
2. Maintaining higher than expected performance based on student demographics and prior academic performance;
3. Demonstrating academic proficiency for a majority of students, or making significant progress toward this goal, and;
4. Attaining a graduation rate above the state average. (Silvernail & Stump, 2012, p.ii)

Criteria 1 and 4 are self-explanatory, but it is important to understand how criteria 2 and 3 were determined and measured. For criteria 2, each school's past performance was compared to an average predicted performance based on scores from other schools of similar demographics (percentage of students eligible for free or reduced lunch prices), rather than comparing the school against the statewide averages. In that way, a school would not be determined as higher performing simply because of higher student performance than the state average: it must also perform better than predicted by the student demographics. For criteria 3, the researchers determined the average percentage (over three years) of students in the school that were above proficiency, assigning a Z score for each school and comparing the score to the state average.

Of the 524 schools evaluated, 119 (22.7 percent) were identified as higher performing. The per-pupil expenditures for those schools were then compared to the statewide average and to schools in communities of similar demographics. In that two-tiered system, academically higher performing schools that also spent less per pupil than the reference set were classified as more efficient. Of the 119 higher performing schools, 90 were determined to be more efficient, meaning 17.2 percent of all Maine public schools studied earned that distinction.

While nearly one-quarter (23.6 percent) of K-5 schools were found to be more efficient, only 17.9 percent of middle schools (grades 6-8) met the standards necessary for the designation. High schools seemed to have the most difficulty earning more efficient status; only 14 (13.2 percent) were found to be higher performing, and a mere 9 (8.6 percent) were found to be more efficient.

The researchers then set out to determine the distinctive features of Maine's more efficient schools. Through site visits that included surveys, interviews, data collection, and classroom observations, it was determined that those schools maintained high standards for all members of the school community, implemented rigorous curricula, and provided engaging instruction. The schools had good leadership and school cultures that supported learning, but what was found to be unique among all more efficient schools was their sustained focus on the intellectual development of students. Silvernail and Stump (2012) report:

More Efficient Schools are student-focused learning communities in which there is systemic evidence of:

(A) Intellectual Work:

i. Students engage in intellectual work that involves academic knowledge and skills as well as social and behavioral learning.

ii. Adults engage in intellectual work to create instructional practices, curricula, professional learning programs, and leadership roles that improve student performance and are informed by assessment and experience.

(B) Equity:

i. Teachers and leaders believe they have a moral obligation to focus on the intellectual development of students as a means towards a better world.

ii. High standards and high expectations are held for all members of the school community.

(C) Efficiency:

i. Human and financial resources are used efficiently to maximize learning opportunities for students and staff. (p. 10)

The study also found many similarities between more efficient schools and those that did not earn the distinction. For example, the size of a school seemed not to matter, as the average size of the more efficient K-8 schools was 166 students, while the average size of all other K-8 schools in Maine was 173 students. More efficient schools actually had a slightly higher percentage of students from socioeconomically disadvantaged backgrounds (47.6 percent) than the state average (46.9 percent), and the differences in the size of the special education population were barely discernible (15.3 percent for

more efficient schools, 15.7 percent for all others). Teachers' level of education and years of experience were almost identical, but class sizes and student-staff ratios were actually larger in the more efficient schools, by nearly one student per class.

At the high school level, significant differences were found in almost every category. More efficient high schools were significantly larger (679 to 523), and had remarkably lower rates of students from socioeconomically disadvantaged backgrounds (15.2 percent versus 44.0 percent state average), students with special needs (12.1 percent to 16.2 percent), and teachers at more efficient schools were far more likely to have earned an advanced degree (60 percent to 40 percent).

The largest statistical difference, in terms of inputs, between more efficient schools and all others at the K-8 level was found to be in per-pupil expenditures, where more efficient schools, on average, spent nearly 14 percent less per student than other schools. That difference decreased at the high school level, where more efficient schools were closer to the statewide average, spending just $119 (or 1.3 percent) less per student.

MEPRI conducted its study of Maine's more efficient schools in an effort to determine what practices were in place at those schools that contributed to their performance and efficiency. In so doing, MEPRI provided a format for identifying more efficient schools in the state, considering first if a school was higher performing by comparing performance against expectations and, secondly, if it was more efficient by spending less than a reference set of comparable schools. MEPRI's findings indicate that there are distinctive traits found in more efficient schools such as a focus on intellectual work, high standards and expectations for all members of the community, and an effort to ensure that resources are used to maximize learning opportunities for students and staff.

The study also noted that there were similarities found between typical schools and more efficient schools.

However, like many studies considering resource allocation and student performance, the MEPRI study used district-wide per-pupil expenditures as the sole financial metric. Therefore, the researchers were not able to determine if, and to what extent, resource allocation differences exist between those schools. The goal of the study was to identify if differences in resource allocation do, indeed, exist at the district, school, and programmatic level between more efficient schools and typical schools.

Rationale for Research Design

The study analyzed quantitative data over the three-year period identified in the MEPRI study (2008-2010) to determine if, and how, more efficient schools allocate resources differently from typical schools. Following the quantitative study, a focused qualitative study was conducted to further understanding of the data. The reason for the mixed-methods study was to first investigate quantitatively to determine if, and to what extent, resources were expended for different programs or expenditure categories. It was hoped that the subsequent qualitative study would provide further insight as to how, or why, those expenditure decisions were made. In that manner, it was an ex-post facto, sequential explanatory study, with the results of the quantitative data analysis informing the design of the qualitative portion of the study.

Description of Research Design

This study first considered quantitative data in the form of per pupil categorical expenditures and categorical expenditures as a percentage of total spending over a three-year period from 2008-2010 to determine if more efficient schools allocate resources to

different functions within the budget than typical schools. Expenditure data were collected and sorted according to the National Center on Education Statistics (NCES) accounting codes using three different models, which were referred to throughout the study as the MDOE model (Maine Department of Education), the NCES model (National Center for Education Statistics), and the RS model (Roza & Swartz (2007) School Spending Profile). The MDOE model allowed for a comparison of 11 "warrant article" cost categories between schools at the district level; the NCES model allowed for school level comparisons of each expenditure object within the school cost center; and the RS model provided for the analysis of differences between more efficient schools and typical schools in researcher-determined expenditure categories.

Following the quantitative analysis, the qualitative study consisted of interviews with policymakers from a sampling of the schools in the study, and a review of fiscal policies from each of the 18 sample schools. Through the interviews, the researcher sought to determine if resource allocation decisions were made differently in more efficient schools than typical schools, while the review of policies allowed for a comparison in the decisionmaking processes in each school.

The quantitative study was completed first, with the results highlighting items of specific importance that were then explored in the qualitative study. That is typical of the mixed methods approach to research, where one approach (in this case, the quantitative study) provides data for further study by the second approach. For example, because the quantitative study indicated that more efficient schools expended less money per pupil on facilities, the qualitative study sought to understand the factors driving facilities

expenditures in the three years of the study. The quantitative study, therefore, served to focus the qualitative study.

Mixed methods studies provide challenges for a researcher, as they require extensive data mining and analysis in both the quantitative and the qualitative research (Creswell, 2009). That proved to be time intensive, requiring an understanding of both quantitative and qualitative methods in this study. However, this study required the mixed methods approach in order to understand not only "where" resources were allocated within the more efficient schools, but also to explore "how" and "why" the resources were allocated as they were. To have limited this study to only the qualitative data or just the quantitative data would have been to ignore the importance of significant data that were retrieved from the other portion of the study, leaving the reader wondering either "where" resources were allocated, "how" resources were allocated, or "why" resources were allocated as they were.

The strength of the sequential-explanatory strategy is the straightforward approach and the clear delineation between the collection and analysis of quantitative data and the collection and analysis of qualitative data. As mentioned earlier, that effort required more time, but the separate stages of data collection and analysis were important as the quantitative study provided direction for qualitative data to be gathered.

Methodology

Research Questions

This study sought to address the following research questions:

1. Do Maine's more efficient public high schools expend fiscal resources differently than the typical school?

2. Do different resource allocation models vary in how they reveal differences in expenditures between more efficient schools and typical schools?
3. Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are those practices?

As discussed earlier, much of the research around education expenditures and student performance has provided mixed results; the relationship between per-pupil spending and academic outcomes is unclear. However, the majority of studies has considered spending only at the district level, or have analyzed only overall school-level per-pupil expenditures. This study recognized that a more in-depth analysis of where schools allocate their resources within the overall context of the expenditure budget was necessary. Therefore, this study attempted to go well beyond measuring expenditures purely on a school-wide or district-wide basis and considered more specific, per-pupil expenditure categories for each school.

Hypothesis

As there is no current research to suggest that Maine's more efficient schools allocate resources differently than typical schools, or that various allocation models differ in their ability to measure differences in resource allocation, or any clear guidance from national studies, this study was conducted with three null hypotheses ($H_0 1$, $H_0 2$, $H_0 3$):

Null Hypothesis 1

$H_0 1$: There is no significant difference in how Maine's more efficient public high schools allocate fiscal resources than typical Maine high schools.

Null Hypothesis 2

$H_0$2: Different resource allocation models do not vary significantly in how they reveal differences in resource allocation or expenditures between more efficient schools and typical schools.

Null Hypothesis 3

$H_0$3: There are no unique budget development practices common to more efficient schools that are not found at typical schools.

Operational Definitions

Throughout this study, several terms were used that may have different definitions outside of this research. It is important that the reader understand how those terms were defined for the purpose of this study.

Average per-pupil expenditures – the mean amount of money spent within identified expenditure categories, or in total, over the three year period of this study (2008-2010), rounded to the nearest dollar.

Exclusive expenditure model – A model for analysis in which the researcher removes identified expenditures for district-level activities or other items beyond the control of the school-level policymaker (facilities, debt service, transportation, etc.).

Inclusive expenditure model – A model for analysis that includes all identified expenditures for each school, including those that may be for district-level activities.

More efficient schools – Schools identified by MEPRI as being higher-performing and doing so at expenditure levels that are below the mean of a comparison set of schools of similar student demographics.

Per-pupil expenditures – Three-year average per-pupil expenditures for each high school for fiscal years 2008, 2009, and 2010.

Practices of resource allocation – those identified by interviewees in the qualitative portion of the study.

Pre-determined expenditure categories – Groupings identified for analysis by the researcher prior to organization of the data using the Roza and Swartz model. These categories were comprised of: Administration, Alternative Education, Co-curricular Activities and Athletics, Improvement of Instruction, Limited English Proficient, Regular Classroom Instruction, and Special Education.

Resource allocation – The expenditure of funds for specific programs or services as defined by each of three models, considering three-year averages, and, through the qualitative study, the decisionmaking processes that lead to such distribution. The MDOE model provided comparisons at the district level in eleven warrant article accounts; the NCES model was used for school-level, object code analysis; and, the RS model allowed for comparison of school-level, per-pupil spending priorities within researcher-identified categories.

Revealed expenditure categories – Groupings developed by the researcher using the Roza and Swartz model that became useful for analyzing expenditures after organization of the data was completed. Those categories were: Assessment, Debt Service, Facilities, Student Support Services, and Technology.

Typical schools – Schools that may be higher performing by MEPRI standards, but operate above the state and demographic comparison average for per-pupil expenditures, or schools that may not be higher performing and operate above or below the state and demographic comparison average for per pupil expenditures. In essence, that includes any school not identified by MEPRI as a more efficient school.

Population and Sampling

From a population of just over 150 Maine high schools, 18 were selected for this study. Nine were schools that had been identified as being more efficient by MEPRI (Silvernail & Stump, 2012), and the remaining nine were a sampling of typical schools. Because this was a mixed-methods study that sought to discover, understand, and gain insight into expenditure practices of more efficient Maine schools compared with typical schools within the state, criterion-based (purposive) sampling was employed. Merriam (2009) provides an overview of different criterion-based sampling methods available to the qualitative researcher: typical; unique; maximum variation; convenience; and snowball or chain sampling. This study employed unique sampling, as the nine more efficient schools were identified in the earlier MEPRI study due to characteristics that set them apart from typical schools. Unique sampling was also employed to select nine typical schools for the study. As there is no hard and fast rule for selecting sample size (Merriam, 2009), the researcher was left to select a sample that provided "reasonable coverage of the phenomenon" (Patton, 2002, p. 246). Including in the study 100 percent of the nine more efficient schools easily met the standard of redundancy or saturation called for by Lincoln and Guba (2000). Selecting nine typical schools that were similar in demography to the nine more efficient schools did not provide a similar level of redundancy for the remaining high schools in Maine, as it left more than 130 schools out of the study, but it did provide the diversity of school performance necessary to seek trends in resource allocation policies and practices.

Analyzing data from the Maine Department of Education website for the given years, identified nine typical schools that most closely compared to the nine more

efficient schools in terms of (1) size; (2) percentage of students qualifying for free and reduced price lunch (FRPL); (3) percentage of students qualifying to receive special education services (SPED); and (4) percentage of students who required English language services (Limited English Proficient, LEP). Some consideration was also given to geography, as schools that met the unique sampling descriptors and were closer to a more efficient school were more likely to be included than those that were more remote. As a result, the 18 schools included in the study consisted of a large portion of schools in Maine with comparatively low percentages of students qualifying for free and reduced price lunches and special education services, as shown in Table 3.1.

Table 3.1: Student Demographic Data, Selected Schools

School	School Type	Mean Enrollment	Mean % FPRL	Mean % SPED	Mean % LEP
ME1	More Efficient	703	6.2	9.3	0.0
ME2	More Efficient	860	19.3	16.6	0.2
ME3	More Efficient	571	4.3	9.2	0.0
ME4	More Efficient	680	3.0	10.8	0.0
ME5	More Efficient	262	33.8	8.2	0.0
ME6	More Efficient	757	23.7	8.5	0.0
ME7	More Efficient	797	2.9	8.3	0.0
ME8	More Efficient	1059	13.1	13.3	0.1
ME9	More Efficient	488	4.6	9.7	0.0
TS1	Typical	1038	17.5	9.9	0.0
TS2	Typical	673	18.9	15.9	0.2
TS3	Typical	431	17.8	12.2	0.0
TS4	Typical	548	18.2	7.7	0.0
TS5	Typical	825	14.7	16.9	0.0
TS6	Typical	571	24.7	12.4	0.0
TS7	Typical	1101	15.8	13.8	0.1
TS8	Typical	467	19.0	16.0	0.6
TS9	Typical	624	11.1	13.5	0.1

As shown in this table, each school is identified only as one of nine more efficient schools (ME1 through ME9) or as one of nine typical schools (TS1 through TS9), with corresponding data for enrollment and the percentage of students accessing free and reduced price lunches (%FRPL), special education services (%SPED), and limited

English proficient programming (%LEP). Thirteen of the eighteen schools selected for the study were from Maine's southern-most counties of York and Cumberland. That is a result of the fact that seven of the nine schools identified by MEPRI as being more efficient were from that region of the state.

The qualitative phase of the study consisted of interviews with policymakers from a sampling of the schools in the study. Interviews were designed to foster greater understanding of resource allocation practices. The individuals involved in the qualitative study were a building principal from a more efficient school, one assistant superintendent from a more efficient school, two superintendents from typical schools, one chief financial officer from a more efficient school, and one chief financial officer from a typical school. Those individuals were selected because they represented an equal number of more efficient and typical schools, as well as a range of roles in the budget management process, from school-level to district-level leadership. They were able to offer insight into the resource allocation practices, policies, and reasoning within the school, providing the answers to the questions "how" and "why" resources were allocated as they were.

In selecting the policymakers to be interviewed, it was decided at the outset of the project to speak with individuals with a range of roles in an attempt to identify differences in practices from as many perspectives as possible in a small study. A different study focused on the perspectives of school principals might consider only data from interviews with principals, whereas this study was focused not on the perspective from one position, but on the practices and protocols in place by the district as a whole.

From the pilot study and preliminary discussions with school leaders representing the various positions selected, it was clear that an analysis of policies, practices, and protocols pertaining to budget development would require speaking to individuals with varying levels of responsibility, as some of the individuals interviewed had little awareness of certain areas, while others had greater knowledge and experience. For example, in speaking with building principals, it became clear that they were not as attuned to the roles of school boards, or the actual, district-level policies that govern the budget development process. They were much more attuned to the protocols used when working with their own staff to identify needs, and those used when working with the superintendent to reach an acceptable budget. Business managers, though, were more attuned to district-level policies and the role of their school committees, and could describe the interplay between policymakers at the district level and those at the school level. By interviewing school leaders in a variety of roles, a more complete picture could be developed of the policies and practices in place.

The policymakers interviewed were able to provide information on local expenditure decisions from the school-level and district-level, resulting in a more complete picture of practices and protocols than would be possible had the participants shared the same job title and responsibilities.

Instrumentation

Description of Instruments and Data Collection – Quantitative

The quantitative instruments in this study were three resource allocation models:

- The Maine Department of Education eleven-article cost center model, identified as the MDOE model for this study.

- The National Center for Education Statistics object code model, identified as the NCES model for this study.
- The Roza and Swartz (2007) School Spending Profile, identified as the RS model for this study.

The quantitative portion of the study required collection of three years of financial and contextual data from the sample schools - from fiscal years 2008, 2009, and 2010. These years were chosen as they coincided with the MEPRI study that identified Maine's more efficient schools (Silvernail & Stump, 2012). To simplify the data collection for the NCES and RS models, researchers at MEPRI provided the three-year expenditure data for each school in the study. In that way, this study employed a data collection process similar to the school spending profile suggested by Roza and Swartz (2007) and the expenditure element study conducted by Odden et al. (2003).

To employ the MDOE model, data were initially collected through an online search of the Maine Department of Education's annual warrant article reports. (Districts report annual expenditures to the MDOE using an eleven-category "warrant article" format.) As shown in Table 3.2, the eleven categories allow for the sorting of expenditures into broad groupings such as Regular Instruction, Special Education, System Administration, and Facilities Maintenance. Those categories are called "articles" by the MDOE because voters in each school district are presented those articles for approval through the budget development process each year. It is those eleven categories that provided the basis for analysis at the least granular level in this study.

Table 3.2: Maine Department of Education (MDOE) Warrant Articles and Descriptors
Article 1: Regular Instruction
Includes all salaries and wages, benefits for all regular education teachers and educational technicians. It also includes all non-labor for the classrooms such as general and instructional supplies and equipment. Books, AV supplies and repairs & maintenance are also included in the costs of the classrooms.
Article 2: Special Education
Includes all of the salaries, wages and benefits for special education. teachers and educational technicians. It also includes all of the non-labor costs for the special education department, such as instructional & general supplies, equipment and out of district placements and any professional services not provided by staff.
Article 3: Career & Technical Education
Includes all salaries, wages and benefits as well as instructional supplies books, travel expenses, and tuition for CTE programming.
Article 4: Other Instruction
Includes the programming for gifted & talented, English language learners, alternative education, summer school, athletics, and student activities, including transportation and co-curricular costs. These costs include the salaries, wages and benefits for the staff as well as the non-labor costs such as instructional supplies, dues & fees and stipends.
Article 5: Student and Staff Support
The programs within this article are guidance, health services, curriculum, professional development, library, academic testing, and technology. The costs include the salaries, wages and benefits for those staff. The non-labor costs include professional services for training, travel, books and periodicals, general and instructional supplies.
Article 6: System Administration
This article includes the salaries, wages and benefits for the office of the superintendent, fiscal services, and development. It includes the non-labor costs such as property & liability insurances, advertising, postage, telephone, travel, dues & fees repairs & maintenance and supplies. The School Board costs are also included in this article.
Article 7: School Administration
This article includes the costs related to the administration in each school. It includes the salaries, wages and benefits for the principals, assistant principals and secretaries. The non-labor costs include general supplies, repairs and maintenance, telephone, postage, travel and advertising.
Article 8: Transportation
This article includes the salaries, wages and benefits for drivers, bus monitors, mechanics and administration. The non-labor related costs include principal & interest for bus purchases, diesel and gasoline, insurance, supplies and equipment, electricity and facilities costs specific for the bus garage.
Article 9: Facilities Maintenance
Includes the salaries, wages & benefits for our maintenance, custodial, grounds and security and administrative staff. The non-labor costs include capital improvements, water and sewer, rubbish removal, energy costs such as electricity, heating oil for each of building. It also includes the non-labor costs for building repairs and maintenance, travel, and general supplies and equipment.
Article 10: Debt Service and Other Commitments
This article includes the total principal & interest payments for and outstanding debt owed the school district.
Article 11: All Other Expenditures
This article is for the district's contribution toward food services for the next fiscal year.

To provide for further analysis of the data, the MDOE model was considered in two ways. First, in what came to be called the "inclusive" MDOE model, data were

analyzed for all eleven cost centers. Recognizing that some expenditures are not specific to the school-level, or within the control of a school-level policymaker, it was decided to remove the categories of System Administration, Transportation, Facilities Maintenance, and Debt Service. Each of those is largely determined by district-level administrators and is not related to school-level programming. That came to be known as the "exclusive" MDOE model, which allowed for analysis more directed at programming expenditures within the school, separate from district-level expenses. As will be discussed later, that method of identifying district-level expenditures and analyzing the data "inclusive" of these categories as well as "exclusive" of these categories was followed for all three models.

At the most granular level of analysis in this study, the NCES model identified more than 80 expenditure categories. However, it became clear through a preliminary analysis of the data that varying schools used different categories from one another for similar expenditures, so several categories were collapsed resulting in the 57 categories for comparison shown in Table 3.3.

Considering 57 categories, as opposed to the eleven articles presented through the MDOE model, clearly presented an opportunity for a more targeted comparison of spending practices between schools. For example, whereas the MDOE model grouped expenditures for Gifted & Talented, Limited English Proficiency, Alternative Education, and Athletics under the singular category of Other Instruction, the NCES model identified more specific categories, such as Instructional Equipment, Instructional Supplies, Rentals, and Software. In that way, the NCES model allowed for the most

granular comparison in this study of expenditures between more efficient high schools and typical high schools.

Table 3.3: National Center For Education Statistics (NCES) Expenditure Categories

1. Activity Stipends	21. General Supplies	40. Purchased Services; Other SAU
2. Administration Salaries	22. Instructional Equipment	41. Rentals
3. Advertising	23. Instructional Supplies	42. Retirement Contributions
4. Assistant Administrative Salary	24. Insurance; Non-Employee	43. Salaries
5. Athletics Salary	25. Maintenance Services	44. Software
6. Athletics Stipends	26. Maine State Billing	45. Special Education; Contracted Services
7. Benefits	27. Manager Salaries	46. Stipends
8. Books	28. Mentor Stipends	47. Substitutes
9. Cleaning Professional Services	29. Non-Professional Salary	48. Technology; Rentals
10. Communications	30. Other Benefits	49. Technology; Repairs
11. Curriculum Stipends	31. Overtime	50. Technology; Equipment
12. Construction	32. Part-time salaries	51. Technology; Supplies
13. Copier Rentals	33. Printing	52. Technical Services
14. CTE Equipment	34. Professional Development	53. Transportation; Non-Instructional
15. Debt Service	35. Professional Education Services	54. Travel
16. Department Head Stipends	36. Professional Services	55. Tuition Reimbursement
17. Ed Tech Salaries	37. Professional Dues and Fees	56. Tutors
18. Energy	38. Property; Professional Services	57. Utilities
19. Equipment; Non-Instruction	39. Property	
20. Equipment		

Just as in the MDOE model, the NCES data was analyzed in two ways. The "inclusive" NCES model considered expenditures in all 57 categories, while the "exclusive" NCES model removed twelve categories that included expenditures for which it would be difficult to determine school-level allocations, resulting in a model with 45 spending categories. The excluded categories were:

- Cleaning-Professional Services
- Debt Service
- Insurance – Non-Employee
- Maintenance Services
- Property
- Transportation – Non-Instructional
- Construction
- Energy
- Maine State Billing
- Professional Property Services
- Purchased Services – Other SAU's
- Utilities

To employ the Roza and Swartz (2007) School Spending Profile (RS model), the NCES expenditure data was sorted into twelve researcher-determined categories. To

collapse the data into these categories, expenditures were sorted according to NCES Program, Function, and Object level. Using Microsoft Excel pivot tables, the researcher-assigned labels were developed for each expenditure, and resorted for computation of per-pupil expenditure by category. Several categories had been pre-determined as potential areas of significance worthy of study by the researcher prior to looking at the NCES data, while other categories were revealed through organization of the data as significant expenditure categories within the sample. For example, it was pre-determined that this study would group and analyze expenditures in Administration and Alternative Education, but it was through the organization of the data that it became clear that Student Support Services and Technology were expenditure categories worthy of analysis due to the level of pe-pupil spending indicated by each category.

Table 3.4 provides an overview of the researcher-selected expenditure categories used for the RS spending profile model, denoting if each category were pre-determined by the researcher, or revealed through the sorting of data.

The "inclusive" RS model considered all twelve categories, while the "exclusive" RS model removed Facilities and Debt Service expenditures and considered only expenditures in the remaining ten areas. In addition to employing a t-test to identify significant differences in spending within the categories, the RS model was used in identifying the difference between the actual and the "expected" per pupil expenditure for both types of schools in each area. To do that, the average expenditure within each category was determined, then identified as the "expected" expenditure. Each school's three-year average expenditure could then be compared to the expected to determine if the school, and the two types of schools in total, spent more or less than the expected.

Table 3.4: Researcher-selected Expenditure Categories for application of the Roza and Swartz School Spending Profile (RS Model)		
Expenditure Category	**Expenditures Included**	**Type**
Administration	School administration services	Pre-determined
Alternative Education	Programming of alternative education – separated from regular education and special education	Pre-determined
Assessment	Mandated and locally-selected assessment measures, training, and salaries	Revealed
Co-Curricular Activities and Athletics	Athletic and student activities programming, including administrative, coaching, and advising stipends, contracted services, supplies, and equipment	Pre-determined
Debt Service	Locally-paid principal and interest for bonds	Revealed
Facilities	All costs of maintaining, repairing, cleaning, and improving facilities	Revealed
Improvement of Instruction	Professional development, tuition reimbursement, and curriculum development	Pre-determined
Limited English Proficient	Salaries, benefits, training and supplies for LEP instruction	Pre-determined
Regular Classroom Instruction	Academic programming other than Special Education, Alternative Education, and ELL services (regular classroom and library expenditures)	Pre-determined
Special Education	Special Education, other than Alternative Education and Student Support Services (below)	Pre-determined
Student Support Services	Guidance services, social work services, and student health services	Revealed
Technology	Instructional and non-instructional technology expenditures	Revealed

In all three models, the average percentage of total per-pupil expenditure was calculated for each category, as it was decided that would provide the best method for identifying where each sample population prioritized expenditures, providing a consistency of comparisons across all three models. To explore the demographic differences between the two sample populations, contextual data consisted of the total number of students in each school, the percentage of students eligible for free and reduced lunch (FRPL), and the percentage of students qualifying for special education (SPED) and Limited English Proficient (LEP) services at each school as reported to the MDOE during the three-year study period.

To gauge the effectiveness of the quantitative instruments to provide the necessary analysis, a pilot was conducted of two schools that were not part of the research data. Two Maine middle schools were selected for the convenience of the researcher to collect the contextual and expenditure data. The pilot study consisted of the application of the data to all three spending models, followed by the quantitative analysis described herein. Based on the results of the pilot study, several adjustments were made in the quantitative instruments, the data collection methods, and the data analysis method. First, a change in the data collection method was made, as it became clear that the data could not be obtained from the Maine Department of Education, and researchers at MEPRI were able to provide the data in the proper format. It was also from the pilot study that the idea to consider both inclusive and exclusive modes for each model was developed. It became clear that some district-level expenditures (such as facilities and debt service) were beyond the control of school-level policymakers, and it would be difficult to determine how much of each district-wide expenditure should be assigned to the school-level cost center. The meaningful amount of those expenditures should not be ignored, since those costs are real and have some impact on a school's ability to focus resources elsewhere. It was therefore important to conduct at least one portion of the analysis inclusive of those data. However, in order to determine if school-level expenditures vary between schools, it was important to remove as much of this district-level data as possible, hence the analysis was also conducted exclusive of district-level spending. Finally, the pilot study determined that Chi-Square analysis would not be the most effective method for considering the data, and that the independent t-test and effect size analysis was most appropriate for examining the data. The t-test provided the

analysis correlating multiple dependent variables (expenditure categories) to a single independent variable (school type) while effect-size provided a measure of practical significance by indicating the strength of the relationship between the variables.

Description of Instruments and Data Collection – Qualitative

Following the model of an ex-post facto sequential mixed methods study, the data sought in the qualitative study was driven by the quantitative analysis. Once any similarities or differences in resource allocation were identified during the quantitative analysis, more specific questions were developed to be asked during the qualitative study. That portion of the study involved semi-structured interviews with building principals and district administrators regarding the resource allocation practices employed by the administrations – essentially, how the budget was developed, how priorities were identified, and how targeted programs and services were funded during the three years of the quantitative study. (Appendix B provides a copy of the protocol that guided the qualitative interviews.) The semi-structured interview format was used to allow for flexibility of the researcher in exploring topics of relevance with each subject. As Merriam (2009) explained, the semi-structured interviews were guided in large part by the list of questions and issues to be explored.

Similar to the quantitative study, the qualitative study was piloted, with interviews conducted with two school policymakers. Upon completion of the pilot, it was determined that the interview instrument was useful in gathering the information appropriate to this study, and that the interviews could be adjusted to take into consideration the results of the quantitative analysis.

Data Analysis

Quantitative Data Analysis Procedures

Expenditure comparisons were made using the three models mentioned earlier:

- MDOE model (inclusive and exclusive of district-level expenditures)
- NCES model (inclusive and exclusive of district-level expenditures)
- RS model (inclusive and exclusive of district-level expenditures)

In the MDOE model, district level expenses were recorded according to the Maine Department of Education's Chart of Accounts. The Chart of Accounts was created in 2005 by the MDOE and a group of Maine school business managers "as a means to ensure that financial data collected from school administrative units provides for accurate calculation of state subsidy, statutory updating of the Essential Programs and Services Model, and a means to collect financial data electronically from school administrative units" (Gendron, 2005). In essence, Maine's Chart of Accounts was the state's attempt to make the reporting of financial data consistent among Maine's many school districts.

Because Maine school expenditure data is reported through those eleven categories only at the district level, and because school-level expenditures are largely exclusive of several of the categories, it was challenging to consider the model for school-level data. For example, the MDOE chart of accounts includes categories such as "system administration", "debt service", and "transportation" (see Table 3.2: Maine Department of Education (MDOE) Warrant Articles and Descriptors) which would not be useful in comparing school-level expenditures, as the NCES coding that drives the model does not place any school-level spending in those categories. That was the most generalized strategy for categorization to be used in the study. It may prove helpful to

Maine schools as it is the standardized method of expenditure reporting for all districts in the state, and it is still more specific than using the total per-pupil expenditure number used in a great many studies to date, but to study expenditures at the school level, consideration must be given to removing categories that are not controlled at the school and for which the school-level allocation would be difficult to determines. Therefore, in this study, the MDOE model was analyzed in two ways. First, analysis was conducted using all eleven expenditure categories, referred to as the "inclusive" MDOE model. Then, the categories of Transportation, Facilities, and Debt Service were removed, and the data was analyzed a second time in what was identified as the "exclusive" MDOE model.

Prior to analyzing data using each model, it was important to assure that the data was applied consistently for each school and district. For the MDOE model, the process was fairly straightforward. Although the MDOE chart of accounts has been in place for more than five years, individual differences exist in terms of each district's categorization of expenditures, simply due to the understandings and practices of the individuals entering the data at each school. To increase the consistency of the data and thereby improve the accuracy of any findings, steps were taken to cleanse the data similar to a process used by MEPRI in its review of Maine's Essential Programs and Services funding formula (Silvernail, Sloan, & Bailey, 2011):

- Expenditures were reviewed to ensure that each was properly categorized
- Questionable expenditures were confirmed with school or MDOE personnel
- Expenditures improperly coded were moved to the appropriate category

By consistently placing similar expenditures into matching categories, the study provided an accurate comparison among participating schools.

In the second portion of the quantitative study, the NCES model, cost-center reporting allowed for a more granular examination of expenditures. As described in the review of the literature on resource allocation, the NCES model categorizes expenditures at the school, program, function, and object level, providing the opportunity for the researcher to compare single object spending, or group objects into slightly more general groups for analysis.

For the NCES model (which became the basis for the RS model), the data cleansing process was much more time consuming and complex than it was for the MDOE model. The granularity of the NCES coding system, and the fact that different individuals assigned codes to expenditures at each school over the three-year study period, both contributed to some variance in how costs were categorized. That led to a lengthy process of confirming and grouping expenditures into slightly less specific categories than those of the original data. As explained earlier, the NCES coding system provides dozens of object level codes for expenditures, but not every school uses every code. For example, School 1 may code all co-curricular and athletic coaches' stipends under "Stipends," whereas School 2 may separate athletic stipends from activity stipends, thereby resulting in three categories that differ between the two schools. It was necessary, therefore, to make groups by collapsing various object codes, resulting in 57 object-level groupings for the NCES model.

To reduce the likelihood of researcher bias, the data was first collected from MEPRI without school identifiers attached. The researcher organized the data and

assigned expenditures to categories without knowledge of which school's data were being considered, or whether the school was more efficient or typical. Only after each expenditure had been assigned was the school identifier provided, which then allowed the data to be placed in the proper school-type category (more efficient or typical).

The final step prior to the statistical analysis of the data was to eliminate categories that were of minimal consequence due to their being used by only one or two schools for trace expenditures. For example, only one school recorded expenditures in the NCES category "Assessment for Administration," as that school was the only school that was part of a district that contracted with another district for central office services. Therefore, the category was removed from the list. As in the MDOE model, a second, "exclusive" analysis was run after removing 12 expenditure categories that included spending for items beyond the control of the school-level policymakers (e.g., cleaning services, debt service, non-employee insurance.). It was decided to run both the inclusive and exclusive analyses because the district-level expenditures were clearly too large to be ignored, yet it was also important to see if there were differences in expenditures within the control of the school-level administrators.

The final model to be applied to the data was the Roza and Swartz (2007) School Spending Profile (RS) model. The data analysis for the RS model was bimodal. In the first mode, to maintain consistency with the analysis in the MDOE and NCES models, an independent t-test was conducted for an inclusive model and an exclusive model, comparing the percent per-pupil expenditure within each category between more efficient and typical schools. In the second mode, an attempt was made to follow the basic premises of Roza's and Swartz's method to assist in answering the second research

question, "Do different resource allocation models show differences in expenditures between more efficient schools and typical schools?" Following Roza's and Swartz's methodology, the mean per-pupil spending for the reference set was determined within each of twelve researcher-identified categories. Once the reference set per-pupil mean was determined, the expected expenditure for each school was calculated by multiplying the reference set per-pupil mean by the number of students in each school. Finally, actual expenditures within each category for each school were reported as a percentage of the expected expenditure, revealing how more efficient schools allocate resources differently than typical schools.

In all three models, three-year average per-pupil expenditures for each category were determined by dividing each annual category expenditure by the number of students in the school in the given year, then finding the three-year average using basic statistics. The data were then converted to a percentage of total per-pupil, school-wide spending by dividing each three-year category mean by total school-expenditure mean.

The percent-per-pupil mean for each expenditure category, then, became the basis for the data analysis using an independent t-test. The data were imported from Excel files into SPSS statistical software. For all three models, each cost category represented a dependent variable, with the independent variable being identification by MEPRI as a more efficient school (type 1) or a typical school (type 2).

To analyze contextual data (comparing the demographics of the two types of schools), one-way ANOVA tests (analysis of variance) were conducted to compare several independent variables (percentage of students eligible for free and reduced lunch, the percentage of students qualifying for special education services, the percentage of

students receiving Limited English Proficiency services, student enrollment, average teacher salary, average years of teaching experience, and percentage of teachers with advanced degrees) against the dependent variable of a school's efficiency category (more efficient or typical). It was an important step in this study, for if it were determined that more efficient schools and typical schools demonstrated statistically significant differences in demographic data, it would impact the conclusions drawn from the study. ANOVA is a flexible and efficient technique of data analysis, as it allows for measuring multiple variables in one observation, rather than comparing each variable in a separate observation. ANOVA analysis also allows for each factor to be tested while controlling all others as well as detecting interaction effects between variables, making it statistically powerful. The one-way ANOVA was calculated at the $p < .05$ level to determine if there were statistically significant differences between groups.

For all three resource allocation models, analysis consisted first of an independent sample t-test conducted at the $p < .05$ level to compare the percentage of total, per-pupil expenditure in each category, between more efficient schools and typical schools. Pallant (2013) suggests use of an independent sample t-test when a study considers two different, independent groups (in this case, more efficient schools and typical schools), and the researcher is interested in comparing mean scores on a continuous variable. T-tests are a form of parametric statistical analysis that are more powerful than non-parametric techniques, but make assumptions about the data that are "more stringent" (Pallant, 2013, p. 115). Those assumptions are: (1) the dependent variable is measured using a continuous scale, rather than as categorical data; (2) scores are obtained using a random sample from the population; (3) the data samples are independent of one another; (4) he

populations from which the samples are taken are normally distributed;, and (5) the variability of scores for each of the groups is similar. Assumptions 1 through 4 were confirmed through the data collection process. Assumption 5, known as "homogeneity of variance," was confirmed through SPSS statistical software calculation of Levene's test for equality of variances. The SPSS output provided a Levene's significance value for each dependent variable (each expenditure category). A Levene's significance level greater than .05 indicated that the test was not significant and, therefore the variances were equal. In only five of the 57 object-level categories in the NCES inclusive model was the Levene's value less than .05. Because the SPSS output provided two p values for each data point (one for "equal variances assumed" and one for "equal variances not assumed"), the researcher was able to select the correct measure of significance (p value) comparing the mean of more efficient school expenditures to the mean of typical school expenditures.

In all three models, the independent t-test was conducted with a significance level of $p < .05$ using SPSS data analysis software. That determines the probability level at which the researcher is comfortable making a Type I error – in which the null hypothesis is rejected, but is, in fact, true. A significance level of $p < .05$ indicated a confidence level of 95 percent, meaning there was a five in 100 chance of incurring a type one error in rejecting the null hypothesis (Smith et al., 2009). A p of $<.05$ provided a measure by which to determine whether the difference in per-pupil expenditures in each category between the two samples (more efficient schools and typical schools) were statistically significant. In cases where the differences were greater than .05, the difference was not statistically significant, and the null hypothesis was accepted. If p was less than .05, the

differences in expenditures were deemed statistically significant and the null hypothesis was rejected. With many different variables being measured, there were many opportunities for both statistically insignificant and significant differences.

The independent samples t-test provided a measure of "statistical" significance, but, as pointed out by Fan (2001) and Rosen & DeMaria (2012), statistical significance testing relies very heavily on sample size and does not provide a measure of "practical" significance. Whereas statistical significance may provide a reason for rejecting the null hypothesis, Fan (2001) points out that is not very informative in the practical sense, and use of some measure of effect size for a measure of practical meaningfulness has become standard practice. As defined by Becker (2000), calculating effect size provides a level of analysis that goes beyond the probability measure of a t-test. Over the past twenty years, researchers have increasingly realized the need to provide results of both statistical and practical measures as neither measure, by itself, provides a comprehensive review of the data. Fan (2001) pointed out that the two measures serve different purposes (significance testing evaluates the likelihood of obtaining the outcome by chance, while effect-size measures the strength of relationship between two variables) and should be used to supplement one another, rather than using either in isolation. In fact, the APA Task Force on Statistical Inference in 1999 declared it a "necessity" that researchers provide some effect size estimate when reporting a p value – a shift in philosophy from the APA's 1994 report that simply "encouraged" such analysis (Rosen & DeMaria, 2012).

One of the most commonly used effect size statistics is Cohen's d, which is calculated according to the following formula:

$$d = M_1 - M_2 / SD_{pooled}$$

$$\text{where } SD_{pooled} = \sqrt{[(SD_1^2 + SD_2^2) / 2]}$$

Cohen's guidelines state that $d = .2$ indicates a small effect size, $d = .5$ reflects a medium effect size, and $d = .8$ suggests a large effect size (Smith, Gratz, & Bousquet, 2009).

Stevens (1996) pointed out that the power of a test (its ability to correctly identify whether or not there is a difference between the groups) is dependent on the sample size used in the study (Pallant, 2013). The larger the sample size, the more powerful the test.

When conducting a study with a small sample size such as this, a researcher must be aware of the likelihood that a non-significant result may be due to insufficient power (Cohen, 1988). Some researchers, (Faul, Erdfelder, Buchner, & Lang, 2009) suggest adjusting the classification of effect sizes to match the desired power and the sample size. However, Cohen's guidelines are widely viewed as the best measure of effect size, and whereas effect size is not a scientific statistical measure, but merely a guide for helping the researcher look beyond the statistical measures to see if an effect may be worth considering further, the data in this study were analyzed according to Cohen's scale, and any effect sizes of 0.8 or greater were considered large.

Fan (2001) presents guidelines for combining significance test outcomes with effect size measures that were worth considering during this study. As illustrated in Table 3.5, Fan suggests that as the measure of effect size moves across the scale from smaller to larger, and as the degree of statistical significance moves down the chart from a lack of significance to a finding of significance, the researcher can state with greater certainty that the effect being studied is practically and statistically significant.

By considering effect size along with the test for statistical significance (independent t-test), this study expanded the discussion of significance.

Table 3.5: Fan's Guidelines for Combining Significance Test Outcome with Effect-Size Measure (adapted)

Degree of Statistical Significance		Effect Size: Small →	Medium →	Large
	No ↓	1. It appears there is neither statistical nor practical effect 2. Unless future research indicates otherwise, null hypothesis is favored both statistically and practically.	1. Sample effect looks promising, but cannot be interpreted by itself. 2. Due to small sample size, study may not have statistical power to detect meaningful effect.	1. Some evidence that meaningful effect exists, but could have occurred by chance due to small sample size. 2. Tentatively favor the practical significance of the effect, while keeping an open mind for further research findings.
	Yes	1. Considerable caution is warranted in interpreting the statistical significant findings; they should not be interpreted to mean something practically meaningful.	1. It is very unlikely that the observed effect is due to statistical chance. 2. The effect is meaningful statistically and practically.	1. There is a high degree of certainty that the observed effect is not due to statistical chance, and the effect is also practically meaningful. 2. Conclude with confidence that effect is meaningful both statistically and practically.

Thompson (1993) cautions against using effect-size measures as rigidly as we use the results of t-tests to define significance, and encourages the researcher to consider the setting before applying hard and fast benchmarks to the effect-size measures (Fan, 2001). Therefore, Fan's guidelines were applied with some caution.

Since SPSS software does not conduct effect size calculations, an on-line calculator developed by Becker (2000) and provided by the University of Colorado at Colorado Springs was used for this step of the analysis, and a researcher-developed Excel file was used to calculate and record effect sizes for all dependent variables in the study.

Qualitative Data Analysis Procedures

Qualitative data was analyzed to interpret and make meaning of what was reported through the interviews and document review and required a good deal of inductive and deductive reasoning (Merriam, 2009). In this study, qualitative data were categorized to assist in answering the third research question:

> Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are those practices?

Data responsive to the research question were identified, and codes were assigned to pieces of data in each interview or document. At the basic level of analysis, the data were organized topically and presented in a descriptive narrative. This study attempted to move beyond the concrete nature of basic analysis into a more abstract level where the data were arranged by concepts that described phenomena. At the highest level of qualitative analysis, inferences were made from the data – an activity that LeCompte, Preissle, and Tesch (1993) warn is difficult and risky for most qualitative researchers because they are too close to the data. Indeed, that may have been the case here, but data often lead to inferential conclusions (Merriam, 2009), and it was important to recognize that the categorical (coded) data may not have told the whole story.

Limitations

This study was limited in that district expenditures were looked at for a three-year period, and the policymakers interviewed represented a snapshot in time, whereas district and school budgets have evolved over decades of administrative and public discourse. A debate or specific need that arose seven, ten, or fifteen years ago may still have its

vestiges within a school's expenditure lines, while no current policymakers may have recollection or knowledge of that event.

A second limitation was the quality of the data reported by schools. Most notably, there were some inconsistencies with which expenditures were categorized by different schools in reports to the Maine Department of Education. Data mining and analysis was an important step in this study, as different schools may report expenditures under different categories, despite the state's efforts to provide a uniform reporting mechanism.

The third limitation was the accuracy with which expenditure data was assigned to cost categories during quantitative analysis. Aside from the district's reporting of expenditures through the Maine Department of Education's chart of accounts, there were in some cases few similarities in how districts allocate expenditures. By conducting a pilot study using data from two schools that were not part of the final study, attempts were made to design strategies for improving the consistency with which expenditures are defined.

Delimitations

The study was delimited by defining more efficient schools as those identified in the MEPRI report (Silvernail & Stump, 2012). While there are many ways to define the quality of schools, the MEPRI findings focused largely on student performance as measured by standardized test scores, and were limited in scope to Maine schools. Considering results of standardized testing and graduation rates as the only indicators for school performance, and district level per-pupil expenditure comparisons as a measure of efficiency, the MEPRI study provided a narrow definition of higher performing and more efficient schools. However, this study may be generalizable to high schools of similar

demographic profiles because of the common educational, societal, and budgetary issues and challenges facing schools and school policymakers, but may not be generalizable to schools with higher poverty rates, or with significantly higher populations of students requiring special services.

Another delimitation of this study is that it considered only nine typical schools, rather than looking at all Maine schools. Because of constraints of time and resources, those schools were selected for the geographic and demographic similarity to the higher performing schools. In that way, the study provides important data for consideration by local policymakers. Not unlike those found in other states, schools in Maine differ from one another in many ways (size, expenditures, socioeconomic measures, rural/urban setting, etc.). By comparing schools of similar characteristics, this study presents data that describe how a more efficient school allocates it resources differently than a typical school, therefore providing lessons of importance to school policymakers.

Learnings from the Pilot Study

As mentioned earlier, in preparation for this project, a pilot study was conducted in which quantitative data was collected for two middle schools. Each of the middle schools in the pilot study was from districts that were included in the data for this study – one with a high school that has been identified as "higher performing" and one that qualifies as "typical." The collection of three-year expenditure data at the district and school level was not as easy as originally presumed. Although the data are public information that is submitted annually to the Maine Department of Education, the department refused to provide the data, stating that it did not have enough staffing to respond to this request. The Maine Education Policy Research Institute (MEPRI) was

able to access the data from a previous study, however, and did provide the data for the pilot. A similar process was followed to secure the data for the larger study.

From the pilot study, it was clear that one of the more important and time-consuming tasks would be to properly code the data for each expenditure, and to maintain consistency across districts. To improve consistency, the data was provided for each school without school identifiers. That allowed the data to be coded without knowledge of whether the data was from a more efficient school or a typical school. Once all coding was completed, the school identifiers were provided for proper placement of each school's data set into the appropriate category.

As stated earlier, the pilot study did reveal several concerns that resulted in adjustments to the original plan for this study: (1) Because of the inability of the Maine Department of Education to provide the quantitative data, researchers at MEPRI were called upon to share data as they had gathered it for their 2010 study on more efficient schools, (2) Because the study would, in large part, compare multiple dependent variables against one independent variable, it was determined that an independent t-test and measure of effect-size would provide the best statistical analysis, rather than chi-square, (3) Because of the significant size of district-level expenditures, the need to consider expenditure data inclusive of these costs and exclusive of these costs was realized. Finally, the pilot study confirmed that the qualitative study would need to be flexible to allow for findings from the quantitative analysis to be considered and explored.

CHAPTER IV: FINDINGS

Overview of the Study

The main purpose of this study was to determine if Maine's more efficient public high schools – defined by the Maine Educational Policy Research Institute (MEPRI) as those that are both higher performing and have lower per-pupil expenditures than a scientifically determined comparison set (Silvernail & Stump, 2012) – differ from those of typical schools. Specifically, do more efficient schools allocate resources to programs differently than those that are not identified as more efficient, and do more efficient schools employ decisionmaking practices regarding resource allocation that differ from typical schools with similar demographics? The intent was to examine expenditures at the district, school, program, and object level in an attempt to provide an in-depth analysis of resource allocation in Maine's more efficient schools as compared to typical schools. This study considered three resource allocation models to determine if they varied in the way in which they revealed differences in spending between the two types of schools. The models considered were:

- The Maine Department of Education eleven-article cost center model, identified as the MDOE model for this study.
- The National Center for Education Statistics object code model, identified as the NCES model for this study.
- The Roza and Swartz (2007) School Spending Profile, identified as the RS model for this study.

The quantitative portion of the study required collection of three years' worth of financial and contextual data from the sample schools - from fiscal years 2008, 2009, and 2010. Data were sorted according to NCES coding, and organized into researcher-

determined expenditure categories for final analysis. In the MDOE and NCES models, data analysis consisted of independent t-tests and effect size calculations comparing the three-year mean percent of total per-pupil expenditure for each category between more efficient schools and typical schools. In the RS model, the t-test and effect size analysis was followed by application of the Roza and Swartz School Spending Profile to determine if the model would reveal expenditure differences in a manner that varies from either the MDOE or NCES model.

The qualitative portion of the study consisted of two components:

(1) Interviews with six local policymakers who were involved in budget development at one-third of the sample schools selected randomly from the study; and

(2) A review of fiscal policies of each of the 18 sample schools. In this step, the researcher searched for similarities and differences in policies, practices, and procedures of budget development between more efficient schools and typical schools.

Results of the Data Analysis – Quantitative

Findings – Analysis of Variance of Contextual Data

Analysis of variance (ANOVA) statistical procedures were used to determine if significant contextual differences existed between the more efficient schools and typical schools. The student data analyzed included percentage of students eligible for Free and Reduced Price Lunch (FRPL), the percentage of students qualifying for Special Education services (SPED), the percentage of students qualifying for Limited English Proficiency services (LEP), and the number of students enrolled in the school. Each of these values was determined as a mean percentage of the three-year study period. The ANOVA was calculated at the $p < .05$ level.

As illustrated in Table 4.1, the ANOVA calculation revealed no statistically significant differences in the contextual student data between the two types of schools in this study. As shown in the table, the three-year mean for enrollment, percent of students receiving services for Special Education (SPED), Limited English Proficiency (LEP), and Free and Reduced Price Lunches (FRPL) is presented for each type of school, with the result of the ANOVA indicating the measure of statistical significance in the final column.

Table 4.1: ANOVA of Contextual Student Data

Contextual Data	School Type	Mean Value	Significance
Enrollment	More Efficient Typical	703 697	.958
%SPED	More Efficient Typical	10.4 13.1	.065
%LEP	More Efficient Typical	0.04 0.10	.290
%FRPL	More Efficient Typical	12.3 17.5	.199

This study also considered contextual data for the teaching staff within the two sample populations, for it is commonly understood and well-documented that professional salaries and benefits are the single largest driver in Maine school budgets, often comprising more than three-fourths of entire annual expenditures. It is also commonly understood that teacher salaries are tied most closely to years of experience, followed by level of education. Analysis of the contextual teacher data was conducted to explore differences between more efficient schools and typical schools in terms of average teacher salary, average years of experience, and percentage of teachers with advanced degrees. Table 4.2 presents contextual teacher data for the three-year study period, with average teacher salaries, years of experience, and percentage of teachers with advanced degrees for both more efficient schools and typical schools. The results of

the ANOVA are shown in the final column. As with the student contextual data, no statistically significant differences ($p < .05$) were found in any of the categories. Thus the results of the analyses indicate that the more efficient high schools and typical high schools were comparable.

Table 4.2: ANOVA of Contextual Teacher Data

Contextual Data	School Type	Mean Value	Significance
Average Salary	More Efficient Typical	$54,895 $54,058	.764
Average Years of Experience	More Efficient Typical	13.3 14.3	.422
Percentage of Teachers with Advanced Degrees	More Efficient Typical	46.1 37.3	.075

Findings – MDOE model

The MDOE model was the least granular of the three models, presenting data only at the district level, rather than the school level analysis allowed for in both the NCES and RS models. As stated earlier, the MDOE model was first analyzed using all eleven expenditure categories, referred to as the "inclusive" model. The categories of System Administration, Transportation, Facilities, and Debt Service were then removed, and the data was analyzed a second time in what was identified as the "exclusive" model. The inclusive model was worth examining, as the expenditures in transportation, system administration, facilities, and debt service are meaningful costs that should not be ignored when considering a school district's efficiency. However, the exclusive model provided a more focused look at those expenditure categories in which school-level administrators have more influence and control, and in which costs can be allocated directly to a school – allowing for comparison of expenditure practices and priorities between the two types of schools.

Table 4.3 summarizes the mean expenditure data for both the inclusive and the exclusive portions of the MDOE model. In the table, the three-year mean expenditure within each category is presented for each type of school, along with the mean percentage of overall expenditures for both the inclusive model and the exclusive model.

For example, in the category of Regular Instruction, it can be seen that more efficient schools spent a mean of $4,599 over the three years, which represented 41.8 percent of total expenditures using the inclusive model, and 56.9 percent of expenditures in the exclusive model (removing System Administration, Transportation, Facilities, and Debt Service).

Table 4.3: Expenditure Data; MDOE Model

Expenditure Category	School Type	Mean Expenditure Per Pupil, $	Mean percent of total expenditure per pupil; INCLUSIVE	Mean percent of total expenditure per pupil; EXCLUSIVE
Regular Instruction	More Efficient Typical	4599 4564	41.8 36.3	56.9 51.3
Vocational Instruction	More Efficient Typical	71 251	0.7 1.8	0.9 2.6
Other Instruction	More Efficient Typical	344 506	3.1 3.9	4.2 5.6
Student and Staff Support	More Efficient Typical	935 1273	8.5 10.0	11.6 14.2
System Administration	More Efficient Typical	308 428	2.8 3.3	NA
School Administration	More Efficient Typical	545 653	5.0 5.2	6.8 7.4
Special Education	More Efficient Typical	1559 1650	14.3 13.1	19.4 18.5
Other	More Efficient Typical	24 44	0.2 0.3	0.3 0.5
Transportation	More Efficient Typical	476 550	4.4 4.4	NA
Facilities	More Efficient Typical	1156 1546	10.6 12.2	NA
Debt Service	More Efficient Typical	975 1221	8.7 9.4	NA
TOTAL	More Efficient Typical	10992 12685	100 100	100 100

NA – Not Applicable, values removed for exclusive model

Typical Schools, meanwhile, expended a mean of $4,564 in Regular Instruction over the three years of the study, which represented 36.2 percent of total expenditures in the inclusive model, and 51.3 percent of total expenditures when applying the exclusive model.

Prior to examining the results of the t-tests, effect sizes, and other statistical analyses, it was helpful to make several expenditure comparisons between the two samples of more effective schools and typical schools, to provide a general overview of the comparisons between the two samples.

1. Using the inclusive model (considering all categories designated by the MDOE) the mean per-pupil expenditure for more efficient schools for the three-year study period was $10,992. The mean per-pupil expenditure for typical schools during the study was $12,685. Typical schools, then, spent 15.4 percent more per pupil, per year than more efficient schools.
2. Using the exclusive model (removing System Administration, Transportation, Facilities, and Debt Service), more efficient schools spent $8386 per-pupil per-year, whereas typical schools spent $9367 per-pupil per-year. The difference in average per pupil expenditures using the exclusive model was 11.7 percent, a reduction in the delta between the two types of schools from the inclusive model. That indicates that typical schools spent a larger portion of their budget in those four excluded categories than did more efficient schools. Removing those categories from the analysis did not eliminate the differences between the two populations, however, further validating the need to analyze the data with and without those expenditures. Had removal of those

categories resulted in no difference in expenditures, the exclusive model would have produced no further data for understanding the differences between the two types of schools.

3. Regular Instruction was the only category in which more efficient schools spent more per pupil than typical schools ($4599 per pupil for more efficient schools, compared to $4564 per pupil for typical schools), an interesting fact in and of itself. Even though typical schools spent approximately $1000 more overall per pupil than more efficient schools in the exclusive model, more efficient schools actually spent slightly more than typical schools on Regular Instruction.
4. More efficient schools spent a higher percentage of total per-pupil expenditures than typical schools in two categories: Regular Instruction and Special Education Instruction. In all other categories, typical schools expended a greater percentage of their budget than did more efficient schools, with the exception of Transportation, where the two samples spent an equivalent percentage of all expenditures (4.4 percent). That simple comparison leads to the observation that more efficient schools directed a larger portion of their expenditures toward "the classroom," in both regular education and special education, than did typical schools.

It was instructive to consider the data both ways (including and excluding System Administration, Transportation, Debt Service, and Facilities) because, if the analysis had shown that more efficient schools only spent less per pupil because they had high needs in the district-level expenditure categories, one might conclude that a school would only

be considered more efficient if it were smaller geographically (and therefore had fewer transportation costs), was carrying less debt, and either chose not to, or was not forced to, invest significantly in maintenance and upkeep of the school facilities. By analyzing the data with and without those expenditures, a more meaningful comparison between the two samples became possible. The data showed that, although it was true that more efficient schools spent less as a percentage of total expenditures in three of the four categories (with no difference in Transportation), even when excluding those categories, more efficient schools spent less per pupil, and directed a higher portion of their budgets to regular and special education instruction than did typical schools.

Following that simple analysis, the researcher conducted a more rigorous statistical analysis using t-tests and Cohen's *d*. In the independent t-test conducted at the $p < .05$ level to compare percent of per-pupil expenditures between more efficient and typical schools in the MDOE inclusive model, significant differences were found in two categories: Regular Instruction ($p = .019$) and System Administration ($p = .039$). Interestingly, those two categories showed differences in opposite directions. For Regular Instruction, the data showed that more efficient schools actually spent a significantly higher percent per pupil (54.79 percent) than did typical schools (48.9 percent), whereas it was the typical schools that spent a significantly greater portion of the budget (3.3 percent) on System Administration than did more efficient schools (2.8 percent).

As explained in Chapter 3, due to the small sample size and the desire to analyze the data for practical as well as statistical significance, it was preferable to calculate effect sizes for each category as well. The results of the t-test and calculations of effect size using Cohen's *d* are presented in Table 4.4.

Table 4.4: Significance and Effect Sizes, MDOE Model

Expenditure Category	Significance (2-tailed) INCLUSIVE	Effect Size, Cohen's d INCLUSIVE		Significance (2-tailed) EXCLUSIVE	Effect Size, Cohen's d EXCLUSIVE
Regular Instruction	.019	1.2		.027	1.2
Vocational Instruction	.219	0.6		.216	0.6
Other Instruction	.212	0.6		.165	0.7
Student and Staff Support	.098	0.8		.065	1.0
System Administration	.039	1.1		NA	NA
School Administration	.632	0.2		.353	0.4
Special Education	.263	0.5		.485	0.4
Other	.304	0.5		.289	0.5
Transportation	.895	0.1		NA	NA
Facilities	.052	1.0		NA	NA
Debt Service	.645	0.2		NA	NA

The results for the inclusive model are in the first two data columns, while the results of the exclusive model are shown in the final two columns. For example, expenditure differences between more efficient schools and typical schools in the category of Regular Instruction in the inclusive MDOE model demonstrated a significance level of $p = .019$, with an effect size of 1.2. In the exclusive MDOE model, expenditure differences in the category resulted in a significance level of $p = .027$, also with an effect size of 1.2.

As shown, the Cohen's d calculations for Regular Instruction and System Administration in both the inclusive study and the exclusive study reflect a large effect size (d = 0.8 and above). That indicates that a large percentage of the difference in spending between more efficient and typical schools in those two categories was explained by school type. In the inclusive study, the effect size using Cohen's descriptors was also large for two additional categories that did not show a statistically significant difference in expenditures (Student and Staff Support; $d = 0.8$, and Facilities; $d = 1.0$). Student and Staff Support expenditures in the exclusive model also demonstrated a large

effect size ($d = 1.0$), suggesting that a large percentage of the expenditure difference in that area was also explained by school type.

Using Fan's (2001) guidelines for combining significance test outcome with effect size measure described earlier, it can be concluded that there is neither statistical nor practical effect in the expenditure categories of School Administration, Transportation, or Debt Service. At the other end of the spectrum, there is a high degree of certainty of practically and statistically meaningful effect in the categories of Regular Instruction and Facilities, with a tentative recognition that Student and Staff support is another category in which practical significance ($d = 1.0$) pushes one toward rejecting the null hypothesis, even though statistical significance ($p = 0.65$) is slightly above the threshold identified for the study.

In summary, analysis of the MDOE model, which considered expenditure data in the most general format in this study, resulted in statistically and practically significant differences in two categories, System Administration, where more efficient schools spent less in terms of percent spending per pupil than typical schools, and Regular Instruction, where efficient schools allocated a greater percentage of per-pupil spending than did typical schools. Practical significance was also found in the categories of Student and Staff Support and Facilities. Therefore, the null hypothesis, as considered using the MDOE data analysis, was rejected: more efficient schools do allocate resources differently than typical schools. Additionally, a simple comparison between the two school types revealed that more efficient schools directed a higher percentage of per-pupil expenditures toward regular instruction and special education instruction than did typical schools.

Findings – NCES Model

The second and most granular model analyzed in this study was the NCES model. Unlike the MDOE model, the NCES model considered expenditures as reported at the school level, rather than the district level. Similar to the MDOE model, the NCES data were considered in two formats. In the initial analysis, all expenditures assigned to each school – sorted into 57 expenditure categories – were analyzed using the independent samples t-test at a significance level of $p < .05$. None of the categories in either model produced statistically significant differences in spending levels between more efficient schools and typical schools (Table 4.5). In that table, the significance between expenditures at the two types of schools is presented for both the inclusive model and the exclusive model. For example, in the category of Activity Stipends, the significance of difference in expenditures between more efficient schools and typical schools was found to be .969 in the inclusive model, which considered expenditures in all 57 categories.

In the exclusive model, in which operational expenditures were removed, the difference in expenditures between the two types of schools was found to have a significance of $p = .956$. Keeping in mind that the independent samples t-test was conducted at the $p < .05$ level for determining statistical significance, it can be concluded that none of the differences in expenditures between the two schools are the result of school type. It appears that the NCES model may be so granular, i.e., the spending is so minute within most categories, as to have no statistically significant impact on spending between the two samples of schools.

Table 4.5: Significance of Expenditure Differences between more efficient schools and typical schools, NCES Model

Expenditure Category	*p* Inclusive	*p* Exclusive	Expenditure Category	*p* Inclusive	*p* Exclusive
Activity Stipends	.969	.965	Other Benefits	.211	.210
Administration Salary	.425	.449	Overtime	824	.815
Advertising	NV	NV	Part-time Salaries	.881	.882
Assistant Administration Salary	.765	.775	Printing	.158	.170
Athletic Salary	.878	.885	Professional Development	.698	.697
Athletic Stipends	.162	.138	Professional Education Services	.525	.529
Benefits	.944	.819	Professional Services	.899	.879
Books	.722	.691	Professional Dues and Fees	.834	.868
Cleaning – Prof. Services	.405	NA	Professional Property Services	.083	NA
Communications	.095	.095	Property	NV	NA
Curriculum Stipends	.498	NV	Purchased Services; Other SAU	NV	NA
Construction	NV	NA	Rentals	.126	.124
Copier Rentals	.498	.550	Retirement Contributions	.411	.420
CTE Equipment	NV	NV	Salaries	.089	.090
Debt Service	.096	NA	Software	.118	.117
Department Head Stipends	.736	.769	Special Education; Contracted Services	.286	.281
Ed Tech Salaries	.943	.905	Stipends	.682	.717
Energy	.129	NA	Substitutes	.993	.941
Equipment; Non-Instructional	.182	.196	Technology; Rentals	.268	.268
Equipment	.270	.315	Technology; Repairs	.787	.809
General Supplies	.104	.103	Technology; Equipment	.474	.562
Equipment; Instructional	.216	.199	Technology; Supplies	.458	.447
Instructional Supplies	.841	.838	Technical Services	.216	.215
Insurance; Non-Employee	.493	NA	Transportation; Non-Instructional	.573	NA
Maintenance Services	.298	NA	Travel	.704	.395
Maine State Billing	NV	NA	Tuition Reimbursement	.086	.069
Manager Salaries	.500	.510	Tutors	.513	.363
Mentor Stipends	NV	NV	Utilities	.921	NA
Non-Professional Salaries	.079	.086			

NV = No Value due to lack of data. NA = Not Applicable for Exclusive Model

As reported by Rosen and DeMaria (2012), the APA in 1999 strengthened its position on the necessity for researchers to provide an estimate of effect size whenever reporting a p value. Along with the APA requirements, it was discovered through the early steps in the quantitative analysis that while many of the variances in expenditures between more efficient schools and typical schools did not reveal statistically significant differences, they did reveal differences that may be meaningful to the practitioner. Therefore, a measure of practical significance was conducted through application of effect size calculations, the results of which are presented in Table 4.6.

As illustrated, there were many categories that exhibited differences of medium to strong effect ($d \geq 0.5$). When compared against the p values, as encouraged by Fan (2001) and expected by the APA (Rosen & DeMaria, 2012), there were several categories in which it might be safe to say that the magnitude of effect was of practical significance. In order for this statement to be made, the p value would need to be close to the .05 required by the study, and Cohen's d would need to exhibit a moderate to strong effect (0.5 or larger).

For the purpose of this study, any category in which $p < 1.0$ and $d \geq 0.5$ was considered to be one in which the expenditure differences between the two types of schools demonstrated some level of significance. As shown in Table 4.6, the categories found to demonstrate potentially practically significant differences ($p < 1.0$ and $d \geq 0.5$) included:

Communications ($p = .095$; $d = 0.8$)

Salaries ($p = .090$; $d = 0.9$)

Tuition Reimbursement ($p = .069$; $d = 0.9$)

Debt Service ($p = .096$; $d = 0.9$)

Non-Professional Salaries ($p = .079$; $d = 0.9$)

Table 4.6: Effect Sizes; Expenditure Differences between More Efficient and Typical Schools, NCES Model

Expenditure Category	Effect Size; Cohen's *d*, INCLUSIVE	Effect Size; Cohen's *d*, EXCLUSIVE	Expenditure Category	Effect Size; Cohen's *d*, INCLUSIVE	Effect Size; Cohen's *d*, EXCLUSIVE
Activity Stipends	0.1	0.1	Other Benefits	1.7	1.7
Administration Salary	0.4	0.4	Overtime	0.2	0.2
Advertising	1.3	1.3	Part-time Salaries	0.1	0.1
Assistant Administration Salary	0.5	0.5	Printing	1.2	1.2
Athletic Salary	0.3	0.3	Professional Development	0.2	0.2
Athletic Stipends	1.2	1.2	Professional Education Services	0.4	0.4
Benefits	.03	.03	Professional Services	.06	.06
Books	0.2	0.2	Professional Dues	0.1	0.1
Cleaning – Professional	0.8	NA	Professional Property Services	1.9	NA
Communications	0.8	0.8	Property	1.2	NA
Curriculum Stipends	NV	NV	Purchased Services; Other SAU's	NV	NA
Construction	2.3	NA	Rentals	1.5	1.5
Copier Rentals	0.5	0.5	Retirement Contributions	0.6	0.6
CTE Equipment	1.0	NV	Salaries	0.9	0.9
Debt Service	0.9	NA	Software	2.0	1.2
Department Head Stipends	0.2	0.2	Special Education; Contracted Services	0.5	0.5
Ed Tech Salaries	.03	.03	Stipends	0.2	0.2
Energy	0.8	NA	Substitutes	0.0	0.0
Equipment; Non-Instructional	1.0	1.0	Technology; Rentals	1.0	1.0
Equipment	0.6	0.6	Technology; Repairs	0.2	0.2
General Supplies	1.0	0.9	Technology; Equipm.	0.6	0.6
Equipment; Instructional	1.0	1.0	Technology; Supplies	0.4	0.4
Instructional Supplies	0.1	0.1	Technical Services	2.9	2.9
Insurance; Non-Employee	0.4	NA	Transportation; Non-Instructional	1.4	NA
Maintenance	0.5	NA	Travel	0.2	0.2
Maine State Billing	NV	NA	Tuition Reimburse.	0.9	0.9
Manager Salaries	1.2	1.2	Tutors	0.4	0.4
Mentor Stipends	NV	NV	Utilities	0.1	NA
Non-Professional Salaries	0.9	0.9			

NV = No Value due to lack of data NA = Not Applicable for Exclusive Model

Several expenditure categories exhibited effect-sizes much larger than $d = 0.8$, but with p values greater than 1.0, the combined result of the statistical significance test and the practical significance test did not allow for a clear declaration of significance.

In different expenditure categories than the MDOE model, the NCES practical analysis supported the rejection of the null hypothesis that there were no differences in the allocation of resources between more efficient and typical schools. Unlike the MDOE data, the NCES data was so granular it did not reveal statistically significant expenditure differences between the two samples, but practical significance was found through application of the effect size calculation. That finding supports Odden et al.'s (2003) claim that the governmental accounting system for school expenditures is not helpful in analyzing the differences between schools, because the expenditure categories are microscopic, and seem to remain stable across states and districts over time.

Findings – RS Model

Application of the NCES coding was also useful for this study in that it allowed for development of the RS model (Roza and Swartz, 2007) through the sorting of expenditure data into researcher-developed categories. The RS model provided the opportunity to cluster expenditures from the NCES model into larger, more generalized categories at the school level. In that way, the RS model was conducted with the anticipation that it would provide for analysis of the data at a level more specific than the MDOE model, but not at as granular level as the NCES model.

School-level expenditures were clustered into twelve researcher-defined categories for the application of the Roza and Swartz (2007) school spending profile. As explained in Chapter 3, those categories were developed in two ways. Initially, the

researcher had identified several categories for consideration in the study. Those "pre-determined" categories were: Administration, Alternative Education, Co-curricular Activities and Athletics, Improvement of Instruction, Limited English Proficient, Regular Classroom Instruction, and Special Education. Through the sorting of the expenditure data, several other categories surfaced as being worthy of consideration: Assessment, Debt Service, Facilities, Student Support Services, and Technology

The next step in the process was the determination of mean per-pupil expenditures in each category for each school type for the three-year study period.

Table 4.7: Expenditure Data; RS Model

Expenditure Category	School Type	Mean Expenditure per pupil, $ INCLUSIVE	Mean percent of total expenditure per pupil INCLUSIVE	Mean percent of total expenditure per pupil EXCLUSIVE
Administration	More Efficient Typical	558.78 629.11	6.4 6.4	7.2 7.4
Alternative Education	More Efficient Typical	23.00 57.66	0.2 0.5	0.3 0.7
Assessment	More Efficient Typical	3.33 6.70	.04 .08	.05 .09
Co-Curricular Activities/ Athletics	More Efficient Typical	646.86 640.04	7.3 6.5	8.1 7.5
Debt Service	More Efficient Typical	20.05 84.89	0.2 0.8	NA NA
Limited English Proficient	More Efficient Typical	22.24 19.30	0.3 0.2	0.3 0.2
Facilities	More Efficient Typical	872.60 1282.01	10.1 13.0	NA NA
Improvement of Instruction	More Efficient Typical	60.50 62.42	6.7 6.1	0.8 0.7
Regular Instruction	More Efficient Typical	4893.30 5054.55	55.5 51.2	61.9 59.3
Special Education	More Efficient Typical	1147.65 1238.89	13.2 12.7	14.6 14.7
Student Support Services	More Efficient Typical	432.66 563.87	4.9 5.6	5.5 6.5
Technology	More Efficient Typical	103.64 249.38	1.2 2.3	1.3 2.7
TOTAL	More Efficient Typical	8782.03 9894.09	100 100	NA

Table 4.7 presents the mean per-pupil categorical expenditure for each type of school, as well as the mean percentage of total expenditure for all sample schools over the three-year study period.

At first glance, the results appear to provide some telling data: more efficient schools spent less per pupil than typical schools in 9 of the 12 researcher-developed categories, and nearly $1050 less overall per pupil. The largest expenditure difference was in the area of Facilities, where typical schools spent more than $400 more per pupil than more efficient schools, nearly 40 percent of the total difference between the two populations.

In the second step of the analysis the overall mean per-pupil expenditure in each category for all 18 schools in the study was determined and identified as the expected expenditure. Each school's three year per-pupil average was compared against the expected expenditure, and the difference between the two was calculated as the percentage of expected expenditure. Once the comparison to the expected expenditure was determined for each school in each category, the mean Delta for more efficient schools and the mean Delta for typical schools were determined. For example, the mean per-pupil expenditure for all 18 schools in the study in the category of Administration was $593.94, while the average expenditure over the three years of the study for more efficient schools was $558.78 (from Table 4.7). Therefore, more efficient schools, on average, spent 94.08 percent of the expected, whereas typical schools, with an average Administration expenditure of $629.11 spent 105.92 percent of the expected.

The percentages of expected expenditure for more efficient schools and typical schools in all categories are illustrated in Table 4.8.

Table 4.8: Mean Difference from Expected Expenditure, by School Type

Expenditure Category	Expected Expenditure per pupil, $	% of Mean expenditure, More Efficient	% of Mean expenditure, Typical
Administration	593.94	94.08	105.92
Alternative Education	39.07	52.33	147.67
Assessment	5.01	66.47	133.53
Co-Curricular Activities and Athletics	643.45	100.53	99.47
Debt Service	52.47	48.21	161.79
Limited English Proficient	20.77	107.07	92.93
Facilities	1077.30	81.00	119.00
Improvement of Instruction	61.46	98.44	101.56
Regular Instruction	4973.93	98.38	101.62
Special Education	1193.27	96.18	103.82
Student Support Services	498.26	86.83	113.17
Technology	176.51	58.72	141.28
Total	9338.06	94.05	105.95

As seen here, there were several categories in which spending by typical schools exceeded expenditures at more efficient schools. Typical schools spent more overall (105.95 percent of expected) and more in ten of the twelve expenditure categories per pupil than the sample mean for all schools in the study, while more efficient schools spent more per pupil than the mean in only two of twelve categories; Co-curricular Activities and Athletics (by one-half of one percent), and English Language Learners (by 7.07 percent). More efficient schools spent considerably less than the mean for Alternative Education (52.33 percent), Debt Service (48.21 percent), Student Support Services (86.83 percent), and Technology (58.72 percent).

Comparing against the expected expenditure as a percentage of total value can be misleading, however. For example, when one sees that more efficient schools spend only 52.33 percent of the expected in Alternative Education, while typical schools expend 147.67 percent of the expected, it might appear that a significant difference has been uncovered. When looking at the actual dollars per pupil expended in that area, though, it

is clear that the small amount spent per pupil ($23 per year for a more efficient school compared to $58 per year for a typical school) may not provide enough volume to impact the overall budget in a significant manner.

Roza and Swartz (2007) developed their model to help districts with large numbers of schools (specifically, Denver Public Schools) determine how best to equitably allocate resources among their schools in the future. Therefore, no deeper statistical analysis of the Denver data was conducted by Roza and Swartz; they simply determined the mean expenditure per pupil within a given category and used enrollment data to determine the expected expenditure moving forward – a logical and reasonable approach to resource allocation in large school districts, and one which may be considered as generalizations from that study are drawn.. The purpose of this study, however, was to look back over historical data and determine if there are statistically significant differences in resource allocation between more efficient schools and typical schools. Because the historical data are not being used to predict future expenditures, it was necessary to take the comparisons one step further and apply an independent t-test to determine if the differences discovered were statistically significant.

As shown in Table 4.9, which provides data for the RS "inclusive" model (including all expenditure categories), Regular Instruction expenditures ($p = .020$) provided the only case of statistically significant difference presented in the data. Once again, as was demonstrated in the MDOE model, the statistical significance comes from the fact that more efficient schools expended a larger percentage of their budgets on regular instruction costs, even though typical schools actually spent more per pupil in this category.

Table 4.9: RS Inclusive Model: Independent t-test, per pupil expenditures in researcher-determined categories, More Efficient Schools and Typical Schools

Expenditure Category	Significance (2-tailed)	Effect Size, Cohen's *d*	Effect Size Descriptor
Administration	.931	0.041	Small
Alternative Education	.309	0.495	Medium
Assessment	.492	0.333	Small
Co-Curricular Activities and Athletics	.173	0.672	Medium
Limited English Proficient	.668	0.204	Small
Facilities	.072	0.910	Large
Improvement of Instruction	.711	0.176	Small
Regular Instruction	.020	1.212	Large
Special Education	.803	0.119	Small
Student Support Services	.242	0.573	Medium
Technology	.148	0.716	Medium
Debt Service	.227	0.608	Medium

Though not statistically significant, more efficient schools also spent a higher percentage on Administration, Co-curricular Activities and Athletics, Special Education, Limited English Proficient, and Improvement of Instruction. Applying effect-size calculations to the RS inclusive model (Table 4.6), medium- to large-effect sizes are produced for Alternative Education ($d = 0.5$), Co-Curricular Activities and Athletics ($d = 0.7$), Facilities ($d = 0.9$), Regular Instruction ($d = 1.2$), Student Support services ($d = 0.6$), Technology ($d = 0.7$), and Debt Service ($d = 0.6$). Thus, practical significance is indicated by those data, but the lack of statistical significance for most categories, and the small sample size, demand that the practical significance be considered with great caution.

When one considers expenditures in Facilities, where a statistical significance was not discovered, it can easily be determined that the $410 per pupil Delta between more efficient school expenditures and typical school expenditures is meaningful. The same can be said for the per-pupil Deltas in Student Support Services, where typical schools spent approximately $130 more per pupil than more efficient schools, and Debt Service, where typical schools spent approximately $65 more per pupil than more efficient

schools. As was seen in the MDOE model, those data did not produce differences that are statistically significant, but the variances are certainly meaningful to resource allocation discussions among public policymakers.

To further analyze the RS model data, a similar adjustment to that done in the MDOE and NCES models was made. Removing the expenditures for Facilities and recalculating the percent per-pupil expenditure, the data were analyzed again in what was designated as the RS "exclusive" model. Once again, the intent was to remove costs that are typically beyond the control of a school-level administrator. Because the data had been sorted during the collection process, only expenditures for Facilities needed to be removed.

As shown in table 4.10, when the Facilities expenditures were removed, none of the remaining categories demonstrated statistically significant differences.

Table 4.10: RS Exclusive model: Independent t-test, per pupil expenditures in researcher-determined categories, More Efficient Schools and Typical Schools

Expenditure Category	Significance (2-tailed, *p*)	Effect Size, Cohen's *d*	Effect Size Descriptor
Administration	.734	0.2	Small
Alternative Education	.295	0.5	Medium
Assessment	.537	0.3	Small
Co-Curricular Activities and Athletics	.347	0.4	Small
English Language Learners	.713	0.2	Small
Improvement of Instruction	.813	0.1	Small
Regular Instruction	.145	0.7	Medium
Special Education	.952	0.0	Small
Student Support Services	.172	0.6	Medium
Technology	.129	0.8	Large

Medium to large effect size of the relationship between school type and expenditures was indicated for Alternative Education (d = 0.5), Regular Instruction ($d = 0.7$), Student Support Services ($d = 0.6$), and Technology ($d = 0.8$), but with no categories revealing a p value < 1.0, Fan's (2001) guidelines for combining significance test outcome with

effect size measure allowed only for the researcher to cautiously declare that there is some evidence that meaningful effect exists, but it may have occurred by chance, and one must keep an open mind to further research findings.

The actual expenditure differences between more efficient schools and typical schools as analyzed by both the school spending profile and the independent samples t-test conducted in the inclusive RS model provide sufficient data to reject the first null hypothesis, and recognize that differences do exist in the allocation of resources between the two samples.

Summary of the Quantitative Analysis

The ANOVA analysis, comparing contextual student data for the two school types, found no statistically significant differences in enrollment, percent of students receiving special education or limited English proficient services, or for percent of students qualifying for free and reduced price lunch. Similarly, the ANOVA analysis comparing contextual teacher data found no statistically significant differences in average teacher salary, average years of teaching experience, or percentage of teachers with advanced degrees.

In all three resource allocation models considered in this study, it was demonstrated that typical schools expended more per pupil than did more efficient schools, but each model performed differently than the others in identifying differences among expenditure categories.

Table 4.11 provides a summary of the quantitative findings for both the contextual comparisons and the expenditure data. The least granular model, the MDOE model, identified statistically significant differences in expenditures for Regular

Instruction ($p = 0.019$) and System Administration ($p = 0.039$), with more efficient schools expending a statistically significant higher percentage per pupil on Regular Instruction than typical schools, and typical schools expending a significantly higher percentage per pupil on System Administration.

Table 4.11: Summary of Quantitative Findings	
Contextual Data	
ANOVA	No statistically significant differences found in student or teacher contextual data
Expenditure Data	
MDOE Model	Statistically significant differences found: More Efficient schools spent more on Regular Instruction Typical Schools spent more on System Administration
NCES Model	No statistically significant differences found. Practical significance suggested in five expenditure categories: Communications Debt Service Non-professional salaries Salaries Tuition Reimbursement
RS Model	Statistically significant differences found: More Efficient schools spent more on Regular Instruction as a percent of total per pupil expenditures Meaningful differences found: Typical schools spent more per pupil in ten of twelve expenditure Categories

Although not to a statistically significant level, more efficient schools also spent a higher percentage per pupil on Special Education ($p = 0.410$), while typical schools spent a higher percentage per pupil in all other categories except Transportation, in which the percentage of total expenditures was equal between the two samples. In the MDOE model, it was clear that more efficient schools were able to direct a greater percentage of expenditures toward the classroom in the categories of Regular Instruction and Special Education. More efficient schools spent less per pupil, and less as a percentage of total expenditures, on Facilities, Debt Service, Administration (both system-level and school-level), Student and Staff Support, and Other Expenses. Practical significance was

provided through effect-size calculations in each expenditure category, with Cohen's *d* as the measure of significance. Medium to strong effect sizes were found between school type and expenditures in the areas of Regular Instruction, Vocational Instruction, Other Instruction, Student and Staff Support, System Administration, Special Education, Facilities, and Other Expenditures. Because the statistical significance determined by the t-test did not agree in every case with practical significance determined by Cohen's *d*, Fan's guidelines for combining the two was considered, resulting in the acceptance of significant expenditure differences between more efficient and typical schools in the categories of Regular Instruction, Student and Staff Support, System Administration, and Facilities.

The NCES model found no statistically significant differences between more efficient schools and typical schools in any of the 57 expenditure categories identified by the researcher. However, through the application of effect sizes, approximately half of the expenditure categories demonstrated practically significant differences. When considering the combined statistical and practical analysis, it could be stated that significant differences existed in five categories (Communication, Debt Service, Non-Professional Salaries, Salaries, and Tuition Reimbursement) – enough to reject the null hypothesis.

The RS model provided two modes of comparison. As with the NCES and MDOE models, an independent t-test was conducted on the percent of total per-pupil expenditures between more efficient and typical schools. The RS analysis confirmed the MDOE model results: statistically significant expenditure differences were found for Regular Instruction ($p = 0.020$), with more efficient schools spending a higher percentage

of expenditures in this category. Applying the Roza and Swartz School Spending Profile, meaningful differences were found in the allocation of expenditures between the two types of schools, with typical schools spending more than the expected amount in ten of twelve expenditure categories.

Once again it is important to state that, although some of the data are not "statistically significant," it can be argued from a practical standpoint that the differences are "meaningful." Most notably, the percentage of students receiving Special Education services in typical schools was higher than in more efficient schools (13.1 percent vs 10.4 percent). With a mean enrollment of approximately 700 students for all schools in the study, simple mathematics can be used to demonstrate the meaningful differences. For example, in the case of Special Education, in schools of 700 students, the difference between the typical schools' mean of 13.1 percent of students qualifying for Special Education services and the more efficient schools' mean of 10.4 percent is 19 students (92 students at the typical school compared to 73 students at the more efficient school). Yet, as shown in the data from the RS model, the difference in Special Education expenditures between the two school types is not statistically significant. In essence, that means more efficient schools are directing more money per pupil toward students with special needs than are typical schools. In fact, making use of the contextual data and the per-pupil expenditure data from the RS model (see Table 4.7, p. 95), it can be calculated that typical schools expended a mean of $9,386 per Special Education student over the three years of the study, while more efficient schools expended a mean of $11,052 in the same time period.

The varying results in how each resource allocation model revealed differences in expenditures between more efficient schools and typical schools were important for addressing the second null hypothesis ($H_0$2: Different resource allocation models do not vary in how they reveal differences in resource allocation or expenditures between more efficient schools and typical schools). Each model identified differences in expenditures in different categories and to different degrees of significance, and the RS model provided additional analysis through comparison of expenditure data to a sample mean.

Thus the quantitative data supports rejection of the first and second null hypothesis, as there were differences found in how more efficient and typical schools allocate resources, and there were differences found in how different resource allocation models expose expenditure differences between schools.

Results of the Data Analysis – Qualitative

The qualitative study was focused on addressing the third research question: Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are those practices? The qualitative study consisted of interviews with six policymakers involved in budget development and management at randomly selected schools from the study. Those individuals were: a high school principal from a more efficient school; an assistant superintendent and former principal from a more efficient school; a chief financial officer from a more efficient school; two superintendents, each from typical schools; and a chief financial officer from a typical school. Although those individuals were selected because of their positions during the final fiscal year of the study (2010), it is interesting to note that, because of the frequency with which school leaders change positions and, even, districts,

the six individuals interviewed had worked collectively in ten different positions in eight of the districts in the study.

The interviews were conducted following the conclusion of the quantitative analysis, allowing for questions to be crafted based on the results of the first portion of the study. Interviews were semi-structured, allowing not only for specific questions to be answered, but also for respondents and the researcher to engage in an open dialogue about budget development processes and policies. Each interview was recorded and lasted between 30 and 60 minutes, with the researcher taking notes throughout. Analysis consisted of identifying themes and practices discussed by each respondent, then searching for commonalities and differences among the schools.

Common themes were identified through the analysis of the interview data. Policymakers tended to focus their comments on the areas of budget development, their own roles, policies themselves, the budget approval process, and budget drivers (items that influence expenditures).

The qualitative study revealed no differences in budget development practices or policies between the two sample populations; there were no practices or policies common to the budget development process in more efficient schools that were not also found at typical schools. Interviewees at both type of schools discussed the development of budget needs, requests, priorities, and parameters in similar fashion. They discussed the role of different individuals, boards and committees, and members of the public, as well as administrative processes and district policies. Although there were unique practices identified within each district, and even from one year to the next within certain districts,

there was no clear delineation between specific practices at more efficient schools and typical schools.

The following description provides more detail regarding the interview subjects' responses within specific interview topics.

Budget Development

Each administrator interviewed described the budget development process as one that begins at the administrative level with the superintendent providing direction to building principals and cost-center administrators. In some districts and in some years, the superintendent provided a targeted change in the budget (typically a percentage increase) and directed administrators to present a budget within those parameters. In other years, the administrators would be asked to present a needs-based budget first, which would then be pared down to the level at which the superintendent was comfortable seeking approval from the school committee and, eventually, the public. These two approaches (target-based or needs-based) were used by both more efficient schools and typical schools. One variation on this theme was the practice of "zero-based" budgeting that, again, was attempted by superintendents in both types of schools. In zero-based budgeting, administrators were directed to develop a needs-based budget from the ground up. Rather than simply considering the prior year's budget and adding a percentage to each line item, administrators considered enrollment and programming and developed a budget from "zero" employees and supply lines to present their needs. That format for budget development was used sparingly, but, again, was found in both more efficient schools and typical schools. One of the most notable points about zero-based budgeting was the confusion that existed around the process. Some administrators stated

that they had been developing zero-based budgets for several years, but their understanding was that the strategy called for a zero percent increase on controllable lines, while others demonstrated greater understanding that zero-based budgeting forces administrators to justify every expenditure anew, rather than considering the previous year's budget. That misunderstanding is not minor: to create a budget from the fresh perspective that all expenditures be justifiable not because they have been in place for years, but because the mission of the school demands it, can lead to considerations of more efficient methods of delivering programs and services to students. Unfortunately, administrators at both types of schools reported that zero-based budgeting breaks down as soon as a budget is presented to the public, as the focus immediately shifts to the line item changes from one year to the next, thereby leaving the administrative team with the feeling that the zero-based efforts are not worthwhile, and they may as well return to incremental budgeting.

One step in the budget development process that was mentioned by several interviewees was the focus on the district mission statement and/or strategic plan. In several districts, the strategic plan provided a focus for budget priorities for the coming year or for multiple years. It was the administration's task to address the needs identified in the strategic plan while making every effort to abide by realistic budget parameters (identified as those that would allow a budget to pass a public vote). Not every school in the study had an identified strategic plan. Those that did referred to it throughout the budget development process. That was not a practice that was more common to either more efficient schools or typical schools – it was simply another practice that was found in schools of each type.

Each interviewee described at least one way in which budget priorities and potential reductions were identified within a district. Most frequently, those priorities and areas of potential reduction were debated at the administrative level with all members of the school and district leadership team present and participating. Within that format, however, were several variations on a theme. In some districts (and, again, in some years), priorities were listed on a board for all to view, with projected costs associated with each request. Most frequently, that was presented as a prioritized list, with items most likely to be removed from the budget either at the top or the bottom of the list, depending on the facilitator. However, in two schools (one more efficient and one typical) the concept of "concentric circles" was discussed. In that exercise, a single circle is drawn on the board to represent the core mission of the schools. More circles are added around the core, with headings such as "administration," "co-curricular activities and athletics," "staff development," and others placed in each successively larger circle, indicating items that are further from the core of the school's mission. Those concentric circles are simply another way for administrators to debate and decide upon the budget priorities for the coming year.

One interviewee had served as a central office administrator at no fewer than four of the schools in the study, albeit over the past 18 years. Two of the districts in which the individual had worked were more efficient, while two were typical. Responding to the question of differences in budget development practices, the administrator stated that although there might be unique approaches within each district, or from one year to the next, there did not appear to be any significant differences in overall approach from one district to another.

To summarize, the budget development practices at more efficient schools were not consistent in any way that provided for a noticeable difference from those of typical schools.

Various Roles of Policymakers

Throughout the interviews, policymakers were asked to define the various roles of individuals integral to the budget development process. In both more efficient schools and typical schools, the superintendent had the most significant role in directing the development of the budget. The superintendent would determine if the process to be followed were needs-based, zero-based, or target-based. In each case, the superintendent would communicate the target budget amount from the school committee to the administrative team, and the needs from the administrative team to the school committee. In some districts and in certain years the school committee would develop the target. In other settings the target would come from the town council and, in some years, the target was developed at the superintendent's level. In all schools, the needs were defined at the administrative level, prioritized as a team, and presented to the school committee and community by the superintendent.

The roles varied by district and by the individuals filling each seat (from town councilor to building-level administrator), but the individual uniqueness described within each district did not lead to a generalization of differences between more efficient schools and typical schools. In other words, although each district is unique and has persons of varying experience and expertise filling the roles of policymakers at various levels, there were no common themes to be found among more efficient schools that were not also present in typical schools. In some cases, the town council played a more significant role

in determining the bottom line of the school budget – but that happened in both more efficient schools and in typical schools. In other cases, the school committee played a more significant role in prioritizing the needs presented by the administrators – but, again, that happened in both school samples.

Budget Policies

Through the interviews, as well as through a review of documents, it was revealed that there are no consistent differences between more efficient schools and typical schools in terms of policies that guide budget development and management. Although each of the interviewees could confirm that such policies exist, their own interpretation is that the policies are so generic they do not provide clear direction on the budget development process. A review of fiscal policies of each of the school districts in the study revealed that to be true. Almost every district policy manual contained "Policy DB – Annual Budget," but in most cases, the policy simply stated that the annual budget is for a 12-month period and that the superintendent is responsible for developing and presenting the budget to the school committee. In three instances (twice for more efficient schools and once for typical schools) the policy went into greater detail on the timing of the budget development process. Several districts had additional policies regarding the ability of the superintendent to transfer funds from one line in the budget to another, but those policies were found in both more efficient schools and typical schools and, in large part, the policies simply restated what is already outlined in Maine statute, so there was no difference between the two sample populations in how the policies govern their operations.

Budget Approval Process

Maine law addresses how public school district operating budgets are approved. Because there are several types of school districts (e.g., single municipalities as well as multi-municipality regional school units (RSU), community school districts (CSD), school administrative districts (SAD), and alternative organizational structures (AOS)) there are several formats for the budget approval process. In all cases, the final step is a referendum of the eligible voters in the district. In municipal (single-town) districts, the town or city council must approve the total (bottom-line) budget request from the school committee. A council has no authority to change individual budget lines, but may increase or reduce the total request before presenting it to the voters at referendum. In multi-town districts (RSUs, SADs, CSDs, AOSs), a town council has no statutory authority regarding the school budget; it is the school committee that presents the budget to the voters for approval at referendum.

Seven of the districts in this study were municipal school districts (five of the more efficient schools and two of the typical schools), while seven were RSUs or SADs (four of the more efficient schools and three of the typical schools). The remaining four schools, all of which were typical schools, were members of a CSD. Because the budget approval process for a CSD is quite similar to that of the RSU or SAD, it cannot be said that the CSD budget approval process is closely related to a school's ability to be more efficient. Both more efficient schools and typical schools were found in various school administrative structures with various budget approval processes, with no clear correlation between school type and approval process.

Budget Drivers

Because the quantitative portion of the study had been completed prior to the interviews, the researcher was able to share with the interviewees the results of the quantitative analysis. Interviewees were then asked, "Why do you think it is that more efficient schools spend more per pupil than typical schools in only one area – classroom instruction – while typical schools spend more on facilities, student support services, technology, and every other major expenditure category?" The consistent answer came back: "needs." Administrators felt that it was not a matter of spending money more wisely that allowed certain schools to be identified as being more efficient – it was a matter of typical schools having greater needs and, therefore, having higher costs. One administrator echoed the thoughts of others when he said, "We spend much more on vocational education than the more efficient schools – and it still isn't enough. We have kids who need that type of instruction, and we shouldn't reduce our costs in that area simply because it will make us more efficient." That was a common theme – even among the administrators at more efficient schools – the idea that student needs drive the budget, and despite what was being spent and how well the schools were doing in general, there were still many more student needs than a school was able to address effectively. Administrators at more efficient schools pointed to the smaller amounts their districts were spending in areas such as vocational instruction, student support services, and technology, and shared their concerns that they were not doing all they should be doing for students. Administrators at typical schools observed the higher amounts their districts were funneling toward those cost areas and said it still was not enough, yet it was impacting their ability to direct resources to core classroom instruction.

One administrator at a more efficient school stated that the school was the only high school in the county that did not provide one-to-one technology for students, while an administrator at a typical school said it, too, might be a more efficient school if it had not had to invest so much in alternative and vocational education. In each of the six interviews, administrators stated that it was student needs and demographics that drove the expenditure priorities within the operating budget. That did not vary from one type of school to the other.

Summary of the Qualitative Analysis

The qualitative portion of this study responded to the third research question; Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are those practices? The simple answer to the question is, "no." Through interviews with three administrators at more efficient schools and three administrators at typical schools, as well as a review of budget development and management policies at each of the schools, it was clear that the processes involved in developing and managing the budget do not vary substantially from one type of school to another. Although each school employs unique strategies each year, including zero-based budgeting, incremental-budgeting, needs-based budgeting, or target-driven budgeting, those strategies and formats are used by schools of each type depending on local circumstances in a given year. Therefore, through the qualitative study, the null hypothesis was accepted: there are no unique practices common to more efficient schools that are not found at typical schools.

It may be speculated that the processes used to develop school budgets may be similar, but result in different expenditure patterns, simply because policymakers at each

type of school, or in each community, may have differing philosophies as to how best to serve the students of the community. Just because two schools follow a similar decisionmaking process, does not mean they will arrive at the same decisions. It appears that the individuals involved in the process will each bring individual biases and opinions, which leads to the potential for differences in decisions. Also, each district will be acting upon budget practices that have been in place for several, if not many, years. Change is difficult and slow in coming to organizations, and public schools in Maine are no exception to that phenomenon. Priorities and expenditure patterns that may have been identified more than a decade ago could still have an impact in the current year, simply due to the personalities involved in the programs or the perceived priorities of the community. For example, the employment of a full-time band instructor may be a foregone conclusion in one high school due to the current instructor's ability to draw students to the program, produce quality performances, and create community support, whereas another school of similar demographics may employ a part-time instructor simply because the program has never grown to the level requiring more staffing. The two schools may follow a similar process in developing the budget, but without much consideration at all, they end up with different expenditure patterns due to pre-conceived or traditional spending practices and priorities. Therefore, it is not surprising that budget development policies and practices do not differ among schools even when expenditure patterns vary widely; traditions and priorities have evolved in each community over time, and shifting expenditures away from existing programs is a difficult exercise for any public policy-maker.

Overall Summary of Quantitative and Qualitative Analysis

The reader is reminded that there were three null hypotheses for this study. The first null hypothesis provided the main focus of the quantitative portion of the study: Hypothesis 1

> **$H_0$1: There is no difference in how Maine's more efficient public high schools allocate fiscal resources than typical Maine high schools.**

Both the MDOE model and the RS model provided statistically and practically significant results to allow for rejection of the first null hypothesis. Each of these models also provided what this study identified as "meaningful" comparisons between expenditures at typical schools and those at more efficient schools. It was clear from the analysis that more efficient schools spent less on operational costs such as transportation, facilities, and debt service, and spent more on regular instruction than typical schools.

The NCES model produced no statistically significant differences in any expenditure categories, which, in and of itself, would lead to the acceptance of the null hypothesis. However, there were differences of practical significance found in the NCES model, and in five of the expenditure categories, these practical differences were large enough, even when considering the statistical data, to provide for rejection of the null hypothesis.

This leads to an interesting discussion – the difference between data that are "statistically significant" and data that are "practically significant." In this study, as in most quantitative studies, it was determined that a statistically significant difference between the two samples would be any difference in which $p \leq .05$. That greatly limits the statistically significant results of the study – and rightfully so, as it is advisable to

avoid making a Type I error (rejecting the null hypothesis when it is, in fact, true). A significance level of $p \leq .05$ results in 95% confidence that a Type I error is avoided. However, it does not mean that other differences that were found are not meaningful to the practitioner. For example, in the category of Vocational Instruction, the t-test yielded a significance level of $p = .219$ in the inclusive study, and $p = .217$ in the exclusive study, neither of which is close to the significance level demanded by this study ($p < .05$). Yet, when considering the raw data, we see that typical schools spend $180 more per pupil on Vocational Instruction than do more efficient schools. In a school of 700 students, that would equal $126,000 – a figure that would likely be considered meaningful to most Maine policymakers, even if lacking the power of statistical significance required for this study. The calculation of effect sizes provided a measure of practical significance of $d = 0.6$ (inclusive) and $d = 0.7$ (exclusive) for Vocational Instruction, both of which are considered to be of medium strength. By applying Fan's (2001) Guidelines for Combining Significance Test Outcome with Effect-Size Measure, significant differences were found in two additional areas in the MDOE model (Facilities and Student and staff support), in five additional areas in the NCS model (Communications, Debt Service, Non-professional salaries, Salaries, and Tuition reimbursement), and in one additional area in the RS model (Facilities).

Because the MDOE model and the RS model produced statistically and practically significant differences, and the NCES model provided practically significant differences, this study found that there were differences in allocation of resources between more efficient schools and typical schools. Therefore, the first null hypothesis was rejected.

Hypothesis 2

$H_0$2: Different resource allocation models do not vary in how they reveal differences in resource allocation or expenditures between more efficient schools and typical schools.

As described in Chapter 4, each resource allocation model revealed differences in expenditures between more efficient schools and typical schools to different degrees. The MDOE model and the RS model showed statistically and practically significant expenditure differences between the school types in a number of categories, while the NCES model revealed no statistically significant differences but several practically significant differences. This fact by itself was enough to allow for rejection of the second null hypothesis.

The RS model also provided an entirely different manner for comparing expenditures between schools and school types. In this model, expenditures were sorted into researcher-identified categories, allowing for a more focused study aimed at determining resource allocation differences between schools and school types than provided for in the MDOE or NCES models. With the additional analysis provided through application of the RS School Spending Profile, it was confirmed that different models show variations in resource allocation or expenditures between schools, and rejection of the second null hypothesis was solidified.

Hypothesis 3

$H_0$3: There are no unique budget development practices common to more efficient schools that are not found at typical schools.

The qualitative portion of this study addressed the third null hypothesis. Through interviews with administrators at three more efficient schools and three typical schools, as well as through a review of policy manuals at each school, it was determined that the third null hypothesis must be accepted; no differences were found between more efficient schools and typical schools in terms of their budget development and management practices or policies. There were strategies found that were unique to each district, and even in different years within the same district, but the differences were not consistent between the two school types.

In summary, more efficient schools spend less overall per pupil per year than typical schools. More efficient schools, though, spend a larger percentage of overall expenditures on classroom instruction. Where typical schools make up for these expenditures is in areas such as facilities and student support services. Despite these differences in spending practices, more efficient schools do not differ from typical schools in the way in which resource allocation decisions are made.

CHAPTER V: CONCLUSIONS

Introduction

The purpose of this study was to explore the fiscal practices of Maine's more efficient public high schools in an attempt to determine if there was a difference between these schools and typical schools in how and where they allocate resources. The more efficient schools in the study were nine high schools identified by the Maine Education Policy Research Institute (MEPRI) in a previous study of all Maine schools over the course of the three-year period from 2008-2010 (Silvernail & Stump, 2012). Nine typical schools were selected for comparison with the more efficient schools based on their demographic similarity and geographic proximity to the more efficient schools.

This study considered quantitative data in the form of expenditures over the three-year period as well as demographic data for each of the nine more efficient schools and nine typical schools. Three resource allocation models were applied to the data to determine if significant and/or practical differences existed in spending practices between the two school types. Qualitative data was collected through interviews with local policymakers from three of the more efficient schools and three typical schools, as well as through a review of documents related to budget policies and practices from each of the 18 sample schools.

Three research questions directed the focus of the study:

1. Do Maine's more efficient public high schools expend fiscal resources differently than the typical school?
2. Do different resource allocation models vary in how they reveal differences in expenditures between more efficient schools and typical schools?

3. Are there budget development practices that are common at more efficient schools that are not found at typical schools? If so, what are these practices?

Summary of Study

This mixed methods study followed the ex-post-facto, sequential explanatory approach, in which the quantitative analysis is conducted first and serves to focus the qualitative analysis.

This study first considered quantitative data in the form of per-pupil categorical expenditures as a percentage of total spending over a three-year period from 2008-2010 to determine if more efficient schools allocate resources to different functions within the budget than typical schools. Expenditure data was collected and sorted according to the National Center on Education Statistics (NCES) accounting codes using three different models which were referred to throughout the study as the MDOE model (Maine Department of Education), the NCES model (National Center for Education Statistics), and the RS model (Roza & Swartz School Spending Profile) (Roza & Swartz, 2007). In all three models, analysis of the data consisted of independent samples t-tests at a significance level of $p \leq .05$ and calculation of effect sizes using Cohen's d. The t-test provided a measure of statistical significance, while the effect-size calculation – when considered in conjunction with the t-test results – provided a measure of practical significance. For the RS model, further quantitative analysis was provided by application of the Roza and Swartz School Spending Profile which provides a comparison of per-pupil expenditures within researcher-identified categories between each school type and the average expected expenditure.

Initial quantitative analysis consisted of analysis of variance (ANOVA) testing of demographic data from each school, including student enrollment, percent of students qualifying for special education services, percentage of students receiving Limited English Proficiency services, percentage of students qualifying for free and reduced price lunches, average teacher salary, average years of teacher experience, and percentage of teachers with advanced degrees. This demographic comparison was designed to address the potential that more efficient schools were significantly different from typical schools in terms of student and teacher demographics.

Following the quantitative analysis, the qualitative study consisted of interviews with six policymakers from a sampling of six schools in the study and a review of fiscal policies from each of the 18 schools. Through the interviews and document analysis, the researcher sought to determine if resource allocation decisions were made differently in more efficient schools than typical schools.

Discussion of Results

The ANOVA test comparing contextual data between more efficient schools and typical schools showed no significant differences in student, nor were any significant differences found in teacher pay, experience, or level of education. Statistically, this eliminated the argument that might be made that more efficient schools demonstrate greater efficiency because their students do not require as many specialized services as students in typical schools. Practically, though, this argument deserves further consideration. As discussed in Chapter 4, more efficient schools and typical schools spent practically the same amount per pupil on Special Education, yet more efficient schools had, on average, 73 students receiving special education services while typical schools

had 92 such students. With equal expenditures (per pupil by total enrollment) in this area, it is clear that more efficient schools were able to direct greater resources toward each special education student, by a margin of nearly $1,700. This difference in resource allocation may be very meaningful. As defined by the MEPRI study (Silvernail & Stump, 2012), in order to be classified as a more efficient school, each school had to qualify as higher performing school, and the ability to direct more resources toward students who need the most support may be one important step toward improving performance. With fewer resources directed toward these students, schools that fell into the typical category may have done so simply because they could not meet the qualifier of being higher performing. The same phenomenon is seen in the Limited English Proficient data; more efficient schools had fewer LEP students, but expended more per LEP pupil to provide a greater level of service.

The findings from the analysis of the contextual data assimilate well with the findings from the resource allocation models. In essence, more efficient schools were able to direct more resources toward the classroom, and more resources toward students with the greatest need. This is a key finding of the study; more efficient schools do not simply spend less than typical schools – they actually spend more in areas that more directly impact teaching and learning. The three resource allocation models revealed expenditure differences between more efficient school and typical schools of varying types and degrees. It was clear from the MDOE data that more efficient schools spent more on regular instruction (not only in percent per pupil, but in actual total per pupil) and less on operational costs than typical schools, while the RS model confirmed that more efficient schools allocated a higher percentage of expenditures to classroom

instruction. The NCES model was less definitive, showing no statistically significant differences between the two school types, although application of Fan's (2001) guidelines for combining significance test outcome with effect size resulted in practical differences in five of 57 expenditure categories.

Although typical schools spent nearly 15.4 percent more in total per pupil than more efficient schools ($12,685 vs. $10,992), the MDOE model showed that more efficient schools spent more per pupil (and more as a percentage of total expenditures) on Regular Instruction than did typical schools. Conversely, typical schools spent significantly more on System Administration than more efficient schools. Removing district-level expenditure categories such as System Administration, Transportation, Debt Service, and Facilities, it was further confirmed that more efficient schools spent a larger portion of budgeted expenditures on Regular Instruction and Special Education Instruction than did their typical counterparts.

This finding supports the position that schools that are able to focus a greater portion of resources into the classroom are more likely to demonstrate higher levels of efficiency. More efficient schools do not simply spend less money than typical schools; according to the MDOE model, they actually spend more in the largest expenditure category (Regular Instruction), and more per special education pupil than typical schools. Where typical schools appear to lose the efficiency battle is in expenditures in categories such as debt service, facilities, administration, and student and staff support.

Student and Staff Support is an expenditure category worthy of further consideration. In the MDOE model, that category included expenditures for guidance, social work, health services, and library, along with staff services such as professional

development, travel, and in-service training. Typical schools spent 10 percent of their overall expenditures in this category, whereas more efficient schools were able to limit expenditures here to 8.5 percent of total per-pupil spending – an average annual difference of $338 per pupil. Although the statistical analysis did not identify that as a significant difference ($p = .065$), Fan's (2001) guidelines allow one to consider the large effect size ($d = 1.0$) and determine that the difference did have practical significance. In other words, it was concluded that a large percentage of the difference in expenditures in this category were explained by school type. A more efficient school of average size from those in this study (700 students), spent $236,600 less on student and staff support services than did the average-sized typical school. That would certainly be a meaningful amount to policymakers in any school in Maine: a more efficient school of that size could direct over $100,000 more toward regular or special instruction and still spend $100,000 less than a typical school of the same size.

Employing the NCES model, no statistically significant differences were found in any of the 57 expenditure categories identified in the research. As explained earlier, the granularity of the model resulted in small dollar-value expenditures in most categories and produced correspondingly small differences that did not reveal anything of statistical significance. However, when considering the results of the t-test in conjunction with calculations of effect size, several categories were found to show some level of practical significance. These included Communications, Debt Service, Non-professionals Salaries, Salaries, and Tuition Reimbursement. In examining those categories more closely, many of the expenditures identified in categories showing differences in the NCES model would also be included in the categories found to show significant differences in the

MDOE model. For example, all of the expenditures for Communications in the NCES model would be included in the System Administration category of the MDOE model. Debt Service was a stand-alone category in each model, and Non-professional Salaries and Tuition Reimbursement in the NCES model would be categorized under Student and Staff Support in the MDOE model. Salaries in the NCES model would apply to several categories in the MDOE model, making it the only category for which it would be difficult to draw parallels.

The RS model provided two modes of comparison: statistical analysis using the independent samples t-test at the $p \leq .05$ level of significance; and comparison of categorical expenditures to an expected value based on the three-year mean for all schools in the sample. The most statistically significant difference in expenditures between more efficient schools and typical schools was again found in the area of Regular Instruction. Because the RS model allowed for the separation of expenditures in a different manner than the MDOE model, it was shown that more efficient schools spent less in that category than typical schools. However, as in the MDOE model, more efficient schools allocated a larger percentage of total per-pupil budgets to Regular Instruction (61.9 percent) than did typical schools (59.3 percent). Surprisingly, the only two areas where more efficient schools spent more per pupil than typical schools were in Co-curricular Activities and Athletics, and Limited English Proficient services. In each of the remaining ten categories, typical schools outspent more efficient schools.

The small sample size (and, therefore, the power of the test) limits the statistical strength of the t-test and effect size calculations to detect meaningful effect, but the RS model as employed by Roza and Swartz (2007), which allows for comparison against a

calculated expected expenditure, provides data that cannot be ignored. Typical schools spent over $1000 more per pupil than more efficient schools using that model. In a school of 700 students, the total difference between the more efficient school and the typical school would surpass $700,000 in an average year. No school administrator would consider that insignificant.

This study revealed that the more efficient schools spend their money differently than typical schools, and the three resource-allocation models produced different results when comparing expenditures between the two types of schools. However, the qualitative study did not reveal any differences between the two types of schools when considering the practices, protocols, and policies employed in budget development. The next section of this report will contain a discussion of possible explanations for the finding that typical schools and more efficient schools with similar demographics employ similar budget development practices, yet end up with different resource-allocation profiles.

Implications

It is clear from this study that more efficient schools direct a larger portion of total resources to the classroom, and a smaller portion to operational expenditures and student support services despite following similar resource-allocation practices for populations of similar demographics. Whether for Regular Instruction, Special Education, or Limited English Proficiency, more efficient schools expend a greater portion of their budget in those instructional areas, while typical schools spend more in areas such as Facilities and Student Support Services.

Those results were not all surprising, insofar as it was expected that typical schools would spend more on non-classroom items. What was surprising was the finding

in the MDOE and RS models that more efficient schools actually spent more per pupil than typical schools in Regular Instruction; it would have been predictable to find more efficient schools spending less than typical schools in every category. Even more surprising were the results of the RS model, in which more efficient schools spent more on Co-curricular Activities and Athletics. The finding should not be interpreted as a determination that a school should simply increase spending on athletics and activities to increase efficiency. The actual per-pupil expenditure within the category was almost exactly the same for more efficient schools ($647) as it was for typical schools ($640), but the percentage of total expenditure per pupil was higher in more efficient schools (7.3 percent) than in typical schools (6.5 percent), due to the fact that more efficient schools spent less overall than typical schools.

The challenge for all schools is to determine why it is that they direct resources away from the classroom and other areas in which students are receiving direct instruction in core academics, special education, or co-curricular activities. In all cases, as highlighted throughout the qualitative portion of this study, expenditure allocations are determined by what local officials see as student need. More efficient schools spend less in the areas of student support (guidance, social work, nursing), allowing for more resources to be directed toward instruction. Does that mean typical schools should assume that reduce spending on student support, and diverting those funds to classroom expenditures, will bring about the same results as more efficient schools? That may be the case in a limited number of schools, but it is likely that many schools have identified student support services as an area of need not only to help students advance academically, but given any significant personal challenges to those students, simply help

them survive and be physically, mentally, and emotionally healthy. To reduce those services may leave students with no support inside the school, the only supportive environment some of them may have. The increased role of a school in providing social and emotional services to students and families places administrators in the difficult position of choosing between directing funds to classroom-based activities that benefit a wide range of students, or toward student support services that are more beneficial to a limited number of higher-need students.

The results of MEPRI's study of more efficient schools (Silvernail & Stump, 2012) indicate that those schools engage students "in intellectual work that involves academic knowledge and skills as well as social and behavioral learning" (p.iv). It may be that approach provides as much, or more, support to students as one in which more resources are diverted to guidance, social work, and other non-instructional services, thereby creating the results produces in this study, in which more efficient schools expend a larger portion of the budget in instructional areas, despite a lack of statistically significant differences in student demographics. This study does not offer solutions to that dilemma, but it does suggest that resource allocation practices should be considered in a more analytical manner, and that typical schools may want to consider the reasons behind the expenditure practices of more efficient schools, as it may result in a change in practice and increased efficiency.

Although it may be difficult for schools in districts requiring a great deal of student support services, or those with significant facilities costs and debt service, to compare favorably with those in geographically smaller districts with adequate, well-maintained facilities, policymakers in such schools can apply resource-allocation models

that exclude those categories to make comparisons with similar districts regarding school-based expenditures. Such comparisons can be used both to assist local administrators in identifying area of potential over- or under-spending, as well as to provide data that may be helpful in educating the public as to the needs that cause increased costs within their schools.

There are several key lessons presented through this study for policymakers and public school leaders and staff:

1. Being more efficient does not necessarily mean spending less in every area of the budget; it does mean directing a greater portion of resources to activities in which students are receiving direct instructional or enrichment services, from Regular Education and Special Education to Limited English Proficient services and Co-Curricular Activities and Athletics.
2. Being more efficient is not simply a result of spending less in operational areas such as Transportation, Facilities, and Debt Service. In fact, more efficient schools and typical schools showed no difference in per-pupil transportation costs, and even when removing the other operational expenditures from the equation, more efficient schools spent less overall, and directed a larger portion of resources toward instructional activities. Therefore, allocations in those areas cannot be used as a defense for a lack of efficiency.
3. Efficiency is not related to faculty experience, education level, or salary. This study showed that there are no statistically or practically significant differences in any of those categories between more efficient and typical

schools. Identifying more expensive teacher salaries as a cause for diminished efficiency would be inaccurate.

4. Efficiency is affected by the allocation of resources to student and staff support. In both the MDOE and RS models, it was shown that typical schools spent more in that area, which includes expenditures for guidance, health services, and social work for students, along with items such as professional development and tuition reimbursement for staff. Silvernail & Stump (2012) found that more efficient schools engage students in intellectual work. That is not to say that typical schools do not engage students intellectually, but this study has shown that resources are diverted away from instructional settings and toward support services to a higher degree in typical schools than in more efficient schools. It is not clear if those allocations are made due to conscious, philosophical differences in the approach to supporting students. It is possible that a school could increase its efficiency by reducing expenditures in those areas (though the impact of such reductions was not considered in this study), and would certainly be an area of recommended study for any school contemplating such a strategy.
5. Different resource-allocation models provide varying degrees of specificity for identifying differences in resource allocation among schools. The MDOE model provides Maine policymakers with a fine summary model of district-level expenditures, while the NCES model is far too granular to be of significant use. The RS model, applied as Roza and Swartz intended (with comparisons to an expected mean) provides the most useful and focused data,

although the sorting of data requires a great deal of time and expertise. Still, the benefit of comparing expenditures with more efficient schools of similar demographics is a worthy activity for any school intending to improve efficiency in the long run.

6. Employing true zero-based budgeting processes, in which expenditure plans are developed based on the needs of the student population, and the best methods for meeting those needs, rather than building on a previous year's budget, will assist schools in maximizing efficiencies.

Although it cannot be said statistically that the results of this study are generalizable to schools with high poverty rates or with significantly higher populations of students requiring special services, such schools may still make practical use of the results of the study in two ways: First, the recognition that more efficient schools spend more money per pupil on instructional activities, and more money per special education pupil on special instruction, is an important point. Schools of all demographics should scrutinize large expenditure areas such as student support services and consider if focusing more funds, and therefore more programming and support, in academic areas might yield better results (academically and in terms of efficiency). The more efficient schools did not differ significantly from the typical schools in this study in terms of student demographics, yet they spent less on student support services and more on instruction. It may be that the increased focus on supporting students academically reduces some of the need to support them emotionally, resulting in more efficient schools having fewer reasons for investing in student support services of a formal nature.

Second, this study suggests that schools may benefit from an examination of the basic assumptions by which they create their budgets each year. Rather than simply accepting that current structures are effective, and should be expanded, this study shows that there are more efficient ways to provide programming for students, regardless of the poverty level or number of special education students. One of the more efficient schools in this study had a free and reduced lunch rate of 33.8 percent, and several of the schools in the study (both more efficient and typical) had special education rates exceeding the state average, yet the more efficient schools still spent more on regular instruction than the typical schools, even though it was not apparent from the qualitative study that any recent conscious decision was made to do so. Schools throughout the state can look to this study and ask the question, "How can we direct more resources toward instruction – regular and special education – and support students in ways that we may not have thought about before?" That question may result in a review of administrative structures, and a recognition that local control may not be worth the expense. It may result in a change in student support structures, or an increase in co-curricular offerings as one way to engage students – another area where, surprisingly, it was found that more efficient schools spend a greater portion of the budget. To accomplish that, districts would need to engage in true "zero-based" budget development practices. Through this study, it was determined that both more efficient schools and typical schools claim to have used zero-based budget development protocols at some point during the three-year period of the MEPRI study. However, upon further exploration, it was clear that each of the districts employed the practice only in theory. Administrators at each district stated that, although they may have been directed to create their budget from zero, they actually continued to

look at the previous year's budget and determine what adjustments they could make for the coming year. Others had a naïve understanding of what zero-based budgeting entails, stating their belief that zero-based meant they could present a budget with a zero-percent increase over the previous year. In order for districts of any size, location, or demographic makeup to gain from this study, an important step would be to employ true zero-based budgeting.

In summary, schools can become more efficient. Looking toward a set of more efficient schools for a comparison of expenditures is a viable first step toward understanding resource-allocation practices more fully. In understanding where these more efficient districts allocate resources, it will cause local practitioners to question their own practices and priorities and search for efficiencies within the local budget and program, rather than simply assuming that the way things have been done in the past is the way they should be done in the future.

Limitations of Results

This study was limited in that district expenditures were considered for a three-year period, and the policymakers interviewed represented a snapshot in time, whereas district budgets have evolved over decades of administrative and public discourse. A debate or specific need that arose seven, ten, or fifteen years ago may still have its vestiges within a school's expenditure lines, while no current policymakers may have recollection or knowledge of that event.

A second limitation was the quality of the data reported by schools. Most notably, there were some inconsistencies with which expenditures were categorized by different schools in reports to the Maine Department of Education. Data mining and analysis was

an important step in this study, as different schools reported expenditures under different categories. Despite the researcher's attempts to uniformly code and sort the data, it is likely that some variances remained hidden in the details.

The third limitation was the accuracy with which expenditure data was assigned to cost categories during quantitative analysis. Although each district reported data through the NCES coding system, the sheer number of available codes allows for a great deal of administrative discretion into the assigning of expenditures to expenditure categories. The ability of the researcher to interpret those assignments and place each expenditure into its proper category provided a limitation on the study.

A fourth limitation was that selecting nine typical schools that were similar in demography to the nine more efficient schools did not provide a similar level of redundancy for the remaining high schools in Maine, as it left more than 130 Maine high schools out of the study.

A final limitation was the small sample size of administrators participating in the qualitative portion of the study. Although the quantitative study provided the larger foundation for findings in the study, the qualitative study was designed to address the third research question, and the sample size of participating interview subjects (6) is quite small in comparison with the total number of school leaders participating in budget development process in schools throughout Maine.

Suggestions for Further Research

One suggestion for further research would be to conduct a follow-up study of the original MEPRI research to determine if the list of more efficient schools in Maine has changed over time. If there are changes in the list, it would be instructive to know in

which categories more efficient schools increased spending so as to remove them from the list, while at the same time understanding what typical schools did from 2010 to 2015 to become more efficient. A qualitative study along those same lines would be to research the impact of MEPRI's more efficient schools report had on resource allocation among Maine public schools. Did typical schools from the 2010 study conduct an analysis of spending and alter their resource-allocation practices in such a way that allowed them to become more efficient?

Another area of potential research would be to determine what impact would occur within typical schools if a more efficient school resource-allocation model was developed and applied to their operating expenditures. In other words, if a per-pupil expenditure template were created from the average expenditure data of Maine's more efficient schools, and that template were applied to a typical school, would abiding by these per-pupil expenditures result in significant changes in staffing, class size, and other programming options? The danger in such an exercise is that it sounds much like Maine's Essential Programs and Services funding model. That model has morphed from a template to be used to determine the minimum level of services necessary to help students meet Maine's system of learning results, into a tool employed by political strategists to identify the maximum any school should be spending.

Additionally, it would be instructive to determine if the results of this study are replicable at schools for younger children and at schools with different student demographics (e.g. higher percentage of students qualifying for free and reduced price lunches). Would similar findings be revealed if the study were conducted with more

efficient and typical elementary or middle schools, or at schools with higher rates of students living in poverty?

Further study of specific expenditure categories could be instructive as well. In the area of special education, it would be interesting to know if local costs can be controlled in a more significant way than current practices. For example, can a school improve efficiency by providing in-house services for high-need special education students, as opposed to sending them to special-purpose schools?

Possibly the most interesting study would be one in which a researcher gains a greater understanding of why it is that typical schools expend greater portions of the annual budget on student support services. Is it merely a matter of school traditions and personnel preference? Or are there conscious decisions made regarding the approach to supporting students in need? Although this study found no statistically significant differences in student demographics between more efficient schools and typical schools, and no differences in the ways in which the two types of school develop their expenditure plans, the quantitative data did show that more efficient schools allocate resources differently than typical schools. The discussion around the level of conscious deliberation that leads to higher spending on student support in typical schools is worthy of further study.

There are many questions to ask about school efficiency, from how it is measured to how it can be improved. This study attempted to go beyond the common practice of simply considering total per-pupil expenditures, and analyzed resource allocation at a more granular level, but, as can be seen from the suggestions made here for further study,

there remain many more questions than answers when considering the topic of school expenditures.

Conclusions

This study showed that more efficient schools allocate resources differently than typical schools, and different resource allocation models vary in how they reveal differences in expenditures between more efficient schools and typical schools. The study did not reveal that there were differences in the way in which more efficient schools identify and address priorities when developing their annual budgets.

The fact that there were statistically and practically significant differences in expenditures, but no statistically significant differences in student demographics or the way in which budgets were developed leads to one critical question: why? Why is it that school leaders in both types of schools claim to follow similar protocols, procedures, and policies in developing budgets for their schools, yet schools with similar student demographics end up with dissimilar expenditure priorities and, as a result, different efficiency ratings?

Policymakers at each school indicated that they develop the annual school budget based on what a group of well-intentioned individuals see as the most effective way to meet the needs of the greatest number of students. However, this study revealed that there are tools available to assist these policymakers in analyzing expenditures and comparing their priorities against a set of scientifically identified more efficient schools. The MDOE model studied here is easily the most accessible for Maine school leaders. The 11-item expenditure data for multiple years are readily available on the Maine Department of

Education website. The shortcoming of that model is its lack of granularity, as it presents district-level data sorted into broad categories.

At the opposite end of the scale, the NCES model appears to be too granular, with too many variances between the assigning of object codes to specific expenditures to allow for revealing meaningful differences. By the time each policymaker has assigned an object code for each expenditure, the dollar values are so small that no significance can be found.

The RS model provides the most useful comparisons, as a policymaker can determine the categories to be studied and assign expenditures within those categories. That work is time-consuming and requires access to the NCES data, which may be obtained only through requests to the districts being studied. Once the data are obtained and sorted, however, local school leaders will likely find that model the most practical to work with, as it requires little knowledge of statistical analysis (no t-tests or effect sizes to consider) and considers the data more in the vernacular of today's administrators, comparing actual costs to predicted costs based on a calculated mean.

Once comparisons are made between expenditures at typical schools and those at more efficient schools, policymakers and school leaders may enter into meaningful, data-supported discussions around budget priorities, rather than simply developing next year's budget based on the previous year's expenditures. Greater scrutiny of expenditures in non-instructional areas may result in increased efficiency or the potential to increase services in instructional lines.

As Maine's school buildings continue to age, and as the needs of the student population become more diverse, local policymakers will continue to face challenges that divert resources from classroom instruction. Making use of resource-allocation models that allow for comparisons between schools and districts at the programmatic level, may allow administrators to become more adept at identifying areas of over- and under-spending, more articulate in communicating the needs of the district to other decision-makers (e.g. school committees, town councils, and the voting public), and more analytical of the resource-allocation practices within their schools. The intended result - increased efficiency for all Maine schools – can be achieved if local policymakers are willing to look both inward at their own practices, and outward to a set of more efficient schools.

As stated earlier in this study, whether or not one believes that a strong relationship exists between school resources and student performance, it is important to understand the context of school resource allocation in order to make more informed fiscal policy decisions. As costs continue to rise, as the American economy struggles to recover from a long recession, and as international competition intensifies, schools will continue to be challenged to justify the level at which they are supported financially. In such an environment, it is critical for local policymakers to have the information necessary to focus resources toward areas that most significantly impact student performance.

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Appendix A: Informed Consent for Participation in a Research Study

Title: RESOURCE ALLOCATION IN MAINE'S MORE EFFICIENT PUBLIC HIGH SCHOOLS

Principal Investigator: Andrew Dolloff, Superintendent of Schools
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Introduction:

You are being asked to be in a dissertation study comparing schools identified by the Maine Education Policy Research Institute as Maine's more efficient schools with schools that do not meet the MEPRI definition. You were selected on the basis of your role as a policy-maker within one of the districts identified for comparison purposes. Please read this form and ask any questions that you may have about this study. Your participation is voluntary and you may ask questions at any time.

Purpose of Study:

The purpose of this study to understand if there are fiscal policies or practices that are common to more efficient public high schools that do not exist at typical schools. This project will also increase understanding of resource allocation for Maine's public schools, in an effort to assist local policymakers in increasing efficiencies within their respective districts.

Description of Study Procedures:

If you agree to participate in this study, you may expect to:

1. Provide actual expenditure data for your school or SAU for the fiscal years 2007, 2008 and 2009 in two formats:
   i. District level warrant article expenditures identified by the Maine Department of Education
   ii. Cost center expenditures as organized by your SAU, with line item descriptors if possible
2. Provide budget policies in place during the 2007, 2008 and 2009 fiscal years.
3. Provide other budget-related documents (directives, schedules, etc.) pertaining to the budget development and management process in your district.
4. Participate in one, and no more than two, audio recorded interviews regarding the budget development and management process for your district: Spring 2015

Risks to Being in Study:

Participants must commit the necessary time and effort to cooperate in data collection and participate in the interview process.

Participant: Please initial here to acknowledge that you have read the information on this page → _____

Benefits of Being in Study:

Participants in the study will have the opportunity to reflect on their role in the budget development and management processes, and will be among the first to have shared with them the results of the study.

Confidentiality and Privacy of Data:

The records of this study will be kept confidential to the extent allowed by law.

Voluntary Participation/Withdrawal:

Your participation is voluntary.
You are free to withdraw from this study at any time, for whatever reason.

Contacts and Questions:

The researcher conducting this study is Andrew Dolloff. For questions or more information concerning this research you may contact me at andrew_dolloff@yarmouthschools.org. or 207-838-3890.

If you believe you may have suffered a research related injury, contact Andrew Dolloff at andrew_dolloff@yarmouthschools.org or 207-838-3890

If you have any questions about your rights as a research subject, the study itself, or any research-related injuries, you may contact: Director, Office of Research Compliance, USM at (207)780-4268, or usmirb@usm.maine.edu, or TTY (207)780-5646.

Copy of Consent Form:

You will be given a copy of this consent form and one will be kept in our records file for future reference.

Statement of Consent:

I have read (or have had read to me) the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study. I have received (or will receive) a copy of this form.

Signatures/Dates:

Study Participant (Print Name): _____

Participant or Legal Representative Signature: _____ Date _____

Appendix B: Semi-Structured Interview with Administrator

Introduction:

Thank you for your willingness to take some time to assist me in this study by agreeing to speak with me about the budget process and practices in your district. What you say in this interview will be confidential and will only be reported in a way that will not reveal your identity, such as, "a central office administrator in one of Maine's more efficient schools". It is important that you are comfortable being as forthright as possible in answering these questions, as we this research is aimed at assisting all Maine schools to become more efficient.

I will be recording the interview to ensure that I have an accurate record of your district's practices and policies, and I will be taking notes for the same purpose.

Do you agree to allow me to tape this interview? (If not, I will then ask for permission to take notes and continue with the interview protocol.)

Thank you. I will proceed with the interview.

Date:_____ **Beginning Time:**_____ **Ending Time:**_____

First Name:_____ **MI:**__ **Last Name:**_____

Title:_____

1. What is your role in the development of the annual school budget?

2. Can you describe the role played by each of the following in budget development?
   a. Superintendent
   b. Principal
   c. Teachers
   d. Central Office administrators
   e. School Board
   f. Public
   g. Any others

3. What are some of the budget development processes you have experienced in the past? Is one more prevalent than others?

4. Are there specific policies in place to guide budget development?

5. The quantitative data from this study shows that more efficient schools spend a higher percentage of funds on regular instruction than typical schools. Typical schools spend more money, and a higher percentage of the budget, on facilities (and debt service), student support services, vocational education, and system administration. Can you talk about the reasons you think typical schools spend more in these areas?

BIOGRAPHY OF THE AUTHOR

Andrew R. Dolloff was born in Damariscotta, Maine on March 28, 1965. He graduated from Medomak Valley High School in Waldoboro, Maine in June, 1983 and earned his bachelor of science in secondary education biology at the University of Maine at Farmington in May, 1987. In 1995, Andrew graduated from the University of Southern Maine in Portland, Maine with a master of science in educational administration. He has completed additional post-graduate work at the University of Southern Maine and the University of New England in Biddeford, Maine. He was awarded a doctorate in public policy from the Muskie School of Public Service at the University of Southern Maine in 2015.

Andrew began his career in education as a teacher of biology and chemistry at Dirigo High School in Dixfield, Maine in 1987. He taught chemistry at Lewiston High School in Lewiston, Maine from 1989-1995 before accepting his first position as a school administrator at Wiscasset High School in Wiscasset, Maine.

Andrew is currently the superintendent of schools for the Yarmouth School Department in Yarmouth, Maine. From 2009-2014 he served as the superintendent of schools for Regional School Unit 21 in Kennebunk, Maine. From 1996-2009 Andrew was a school administrator for the Scarborough School Department in Scarborough, Maine, serving as the principal of Scarborough High School from 2000-2006.

In addition to his career in educational administration, Andrew has taught courses in the educational leadership program at the University of Southern Maine, and in 2005 was named to the International Advisory Board of the Harvard Graduate School of Education's Principals' Center. He has served as a member of the Executive Committee of the Maine School Superintendents' Association and is a member of the District Administration Leadership Institute, Phi Delta Kappa, and the Educational Leadership Advisory Board at the University of Southern Maine.