



The University of Vermont  
JAMES M. JEFFORDS CENTER

# **Full Report: Educational Opportunities Working Group on Aligning Funding, Opportunities to Learn and Outcomes of the Educational System**

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**This report presents the findings and discussion from a study by the James M. Jeffords Center responding to questions indicated by Act 156 of 2012, Section 31, of the Vermont Legislature.**

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**December 20, 2012**

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## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the invaluable assistance of many individuals in the compilation of this report. The Chair and Educational Opportunities Working Group members provided valuable feedback on an earlier draft, and all were generous in contributing their time, ideas, and materials in support of this work.

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- The Vermont Department of Education contributed information, reports, and data. We thank Commissioner Armando Vilaseca and all Department staff who contributed to this effort, especially: Bill Talbott, John Fischer, Brian Townsend, Stacey Murdock, Vaughn Altemus, Brad James and Manuela Fonseca.
- The Department of Information and Innovation, especially DII CIO and Commissioner Richard Boes
- The Office of Legislative Council, especially: Donna Russo-Savage and Agatha Kessler
- The Joint Fiscal Office, especially: Mark Perrault
- The Building Bright Futures Council contributed data from the VT Child Development Division through their Early Childhood Data Reporting System; we especially thank Building Bright Futures Director Julie Coffey for facilitating extensive assistance in compiling and interpreting these data.
- Citizens and professionals: (See List of Witnesses, Appendix)
- Others who contributed valuable time and assistance in the preparation of the report include: Laurie Eddy, Professor Kieran Killeen, Professor Chris Koliba, Reeva Murphy and Mark Sustic.

**For the Children and Families of Vermont:**

*We can, whenever and wherever we choose, successfully teach all children whose education is of interest to us.*

*We already know more than we need to do that.*

*Whether or not we do it must finally depend on how we feel about the fact that we haven't so far.*

**Ronald Edmonds, 1977**

# EDUCATIONAL OPPORTUNITIES WORKING GROUP ON ALIGNING FUNDING, OPPORTUNITIES TO LEARN AND OUTCOMES OF THE EDUCATIONAL SYSTEM

## EXECUTIVE SUMMARY

The objective of this report is to provide answers to the fundamental questions posed by Act 156 of 2012, Section 31. The report is the result of testimony before the Working Group established according to the Act and research done by staff of the James M. Jeffords Center and consultants at UVM. The report is presented to the Working Group, the Governor of Vermont and the Vermont Legislature by the Jeffords Center. The answers to the questions raised by the Act can be summarized as follows:

*Does Vermont's current education system allocate financial and other resources in a way that promotes high quality, equitable opportunities for students throughout the state?<sup>1</sup>*

**Available data from testimony to the Working Group, licensing and enrollment for early childhood learning programs, and a 2004 survey of students show that high quality opportunities to learn for students are not equitably distributed throughout the state. However, Vermont cannot allocate its resources in a way that effectively promotes educational opportunities because it currently does not have the data systems and procedures needed to measure those opportunities and allocations.**

*How can Vermont's current education system allocate financial and other resources in a way that promotes high quality, equitable opportunities for students throughout the state?*

**Vermont needs to: (a) ensure that its ongoing educational data system development includes the collection of high quality data on resource allocation and educational opportunities at all levels. Data collection should begin with students and be aggregated to schools, districts and the state; (b) allocate sufficient resources to facilitate local data collection and to analyze the relationship between resource allocation and opportunities experienced by students; (c) integrate the findings of this report with results of ongoing data collection to guide and monitor the execution of the Strategic Plan of the Department of Education; (d) identify and implement the structural and procedural changes in school**

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<sup>1</sup> "Opportunities to learn" *Def.* Throughout the report educational opportunities for students are variously referred to as Opportunity(s) to Learn or OTL. The term refers generally to opportunities that students have to learn knowledge and skill that effectively prepares them for the next level of schooling or career. The terms are more extensively defined in the section below on *Opportunity to Learn (Curriculum, Instruction, Teacher Quality, Time)*. The term may also include opportunities children have for their development and health in early childhood programs and at home.

**district organization needed for consistent and equitable application of state level policy in all Vermont's schools; and, (e) make available to all children, regardless of their place of residence, the opportunities to learn that are needed for success in life and work.**

*How can impediments to opportunity, such as poverty and substance abuse, be mitigated?*

**The educational data systems currently in development, such as the Vermont Automated Data Reporting Project (VADR), need to be implemented and integrated with the information and delivery systems of other agencies, such as Human Services and Health through the Department of Information and Innovation. These linkages need to be used to implement new, coordinated policy and structural supports for integrated services.**

Available data indicates a number of other specific recommendations, which are detailed in the full report.

## THE NEED FOR ACTION

With the passage of Act 156 of 2012, the Vermont legislature identified the need for and provided an evaluation of how Vermont's financial and other resources are being applied in order to "promote high quality, equitable educational opportunities throughout the state." At its first meeting the Working Group discussed the complexity of the task and requested information about alternative methods for evaluating the complex relationships that link school systems to other agencies. The discussion of complexity theory<sup>1</sup> as a framework for analysis of inputs, processes and outcomes of systems led to a broad view<sup>2</sup> of the sources of data that inform the following report. (See below, Framework for Inquiry).

National reports such as Nation at Risk (1983)<sup>3</sup>, Rising Above the Gathering Storm (2007)<sup>4</sup> and Education for Life and Work (2012)<sup>5</sup> have sounded alarms and predicted the imminent decline of American education, economy and society as a result of the failure of its education systems at all levels. In Vermont, there is growing concern for the state's ability to respond to the challenges of changing economic conditions, climate and diversity.

- Availability of early childhood education is not universal for low income families.
- Data from a 2004 survey (detailed in the full report) indicates that student-reported availability of opportunities to learn varies substantially by district and family income.
- Vermont students demonstrate high levels of student achievement on national comparative state assessments, but those outcomes have not changed much in the past decade even though many efforts to improve education have been implemented. Performance varies substantially from district to district and school

to school, and students from low income families score significantly lower than other students<sup>6</sup>.

- In the most recent NECAP assessment, only 36% of 11th grade students met the mathematics standard. Only 47% of Vermont high schools require Algebra 1 before graduation, and only 31% require Geometry.<sup>7</sup>
- Despite high levels of high school graduation, Vermont ranks third from the bottom nationally in the percentage of young people attending college<sup>8</sup>. The Working Group heard testimony that 50% of Vermont community college students require remedial education upon enrollment<sup>9</sup>.

## BARRIERS TO CHANGE

A primary barrier to promoting equitable educational opportunities is that few local board members or citizens have a clear understanding of how their students, their schools and their communities perform on state outcome measures. Measures of school quality, spending, preschool availability, and community support for students from birth to career are rarely made public in a way and at a time that would provide useful guidance for local decision making. While some outcome data are reported at the level of the school, opportunity to learn measures and spending data are not reported to the public in a common format.

A second barrier, underlying the limited reporting of performance on educational opportunities and outcomes, is a lack of resources to facilitate data collection at the local level, and analysis at the state level. The VADR data system under development will facilitate the process, but school districts will need assistance in order to ensure that reporting is complete, timely, and accurate. Once data have been reported and compiled, its value depends on timely analysis and dissemination. Without sufficient resources the state will not be able to use the data it collects.

A third barrier is the limited scope of the information that the public has access to when considering how best to support of students and their families. As demonstrated by the example of Finland, integration of health care, social services and education is needed in order to maximize returns on the limited resources that can be invested. Health care, nutrition, safety and high quality opportunities to learn all need to be equally available to all children and families if the desired educational outcomes are to be realized<sup>10</sup>. The information systems that enable us to understand the availability of these supports need to be integrated so that coordinated strategies can be developed and implemented.

The fourth barrier to opportunity is a lack of demonstrated commitment and agreement on goals and means across all levels of leadership of state and local government as well as the administrative and service delivery agencies that serve the public. Without the will and skill to change, the findings of this report that focus on the design and allocation of resources are unlikely to be implemented. In times of crisis, such as the recent hurricane devastation, it is

evident that many of the leaders have the capacity to act in concert. This function of leadership should become the rule rather than the exception.

## PROGRESS MADE

Vermont has developed a plan for improvement, described in a 2009 report<sup>11</sup> that addresses both general education improvement and equal educational opportunity. That comprehensive plan is *Opportunity to Learn: Defining Vermont Education for a New Generation of Learners*. The recommendations of that report are reflected in the current Strategic Plan of the Vermont State Board and Department of Education, which includes a wide range of strategies for improving education and equality of opportunity. A detailed implementation plan has been presented in draft form<sup>12</sup>. However, although the Working Group heard reports on progress in some areas referenced in the Comprehensive Plan, a more specific report is needed on the progress and measurement of implementation.

The Strategic Plan of the Vermont Department of Education expresses a vision that *Every learner completes his or her public education with the knowledge and skills necessary for success in college, continuing education, careers, and citizenship*. Each of the five Goals described in this plan contains strategies designed to ensure high quality, equitable educational opportunities for all children in Vermont's public schools. The Department of Education is actively pursuing these strategies. For example the recently convened Vermont Education Quality Standards Commission is revising state standards for learning opportunities, and is scheduled to present its initial recommendations in May 2013 (Goal II, Strategy 5).

## SPECIFIC RECOMMENDATIONS

Our recommendations follow from the review of Working Group documents, testimony and study of the literature on opportunity to learn and school performance. A basic principle guiding our recommendations is integration of information and decision making, both vertical (among levels of government) and horizontal (among the partners at each level). The partners in the enterprise of improving opportunities to learn and student outcomes from birth to career include personnel and stakeholders in the systems of health care, human services and education.

The recommendations listed immediately below are the summary recommendations that chart the course forward for the formulation of policy. In the full report to follow, additional detailed recommendations are presented which stem from the observations and data that are presented.

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## INTEGRATION OF SERVICES

Were the recommendations already developed by the Vermont State Board of Education and Department of Education to be implemented, it is likely that the schools would improve and students would achieve better outcomes. *However, without the integration of health, human*

*services, the justice system and education to make the best use of limited resources of the state and its communities, the potential impact of on-going attempts to improve services and outcomes will fall short.* The first step towards meeting this goal would be the development of an information system that provides transparency about the investments made by the State of Vermont, and the outcomes that result from those investments. A second step will be the removal of barriers created by “silos of funding” and conflicting regulations that impede the partnerships among health, human services, justice and education professionals who serve children and families.<sup>13</sup> The third step towards the integration of services will require the adoption of a standards driven decision making culture similar to that described by Friedman.<sup>14</sup>

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#### PRE-KINDERGARTEN OPPORTUNITIES TO LEARN

Pre-Kindergarten opportunities to learn should be available to all children from birth to kindergarten. These opportunities must be of equal quality as ensured by state licensure and review. The data systems currently being designed for monitoring these opportunities should include data on the resource allocations, implementation, and outcomes for pre-K programs. Integration with the Building Bright Futures Early Childhood Data Reporting system could provide a cost efficient means for disseminating early childhood data. *Legislation should be adopted that enables pre-Kindergarten programs to be available to all Vermonters regardless of income level or place of residence.*

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#### A COMPREHENSIVE DATA AND QUALITY OUTCOME INDICATOR SYSTEM

A comprehensive quality indicator system is needed to provide transparency of public investments, the results of those investments (opportunities for citizen development) and the outcomes in measureable terms that are associated with investments of public as well as private funds for support of children and families from birth to career across the health, education and human services systems. Such a system was in place in AHS in 2006.<sup>15</sup>



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STATE PLAN FOR EDUCATIONAL IMPROVEMENT, EQUAL OPPORTUNITY, AND  
RESOURCE ALLOCATION

Implementation of the comprehensive state plan to address education improvement and equal opportunity needs to be reported in a more timely fashion. That reporting needs to specify operational goals, timelines, performance management, and resources needed. The plan should be updated to specifically address the challenges of data collection at the local and state levels and the timeliness of data to coincide with local decision making schedules and scope; it must also provide for regular reporting of progress and reassessment of objectives as new data emerge at both the local and state levels. District level data and reporting will not be sufficient to inform needed changes within schools where the changes must actually occur. Systems of data collection that inform the distribution and assessment of opportunities to learn must begin with students as the unit of measurement and be aggregated to the level of resource distribution.

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# EDUCATIONAL OPPORTUNITIES WORKING GROUP ON ALIGNING FUNDING, OPPORTUNITIES TO LEARN AND OUTCOMES OF THE EDUCATIONAL SYSTEM

## FULL REPORT

### INTRODUCTION

The purpose of this section of the report is to present the detail behind the findings of the Executive Summary. The Full Report includes analysis and mapping of opportunity to learn measures and outcomes by supervisory union. The search for answers to questions related to the relationships among opportunities to learn for all students, funding and spending, and the outcomes of schooling that may result from the investment in Vermont’s educational system is a complex process. The social, economic and political issues surrounding questions about these relationships are best understood by the integration of systems that are currently not fully linked. That is why the Jeffords Center has recommended the integration of health, human services and education in ways that will enable more complete analysis. Resolution of issues that have thus far been identified depends upon the negotiation of values, strongly held views of the roles of students, parents, and communities and the judgments of citizens and policy makers about what constitutes adequate and fair investment. Complexity of the relationships is made even more challenging by the difficult task of measuring the inputs to the system (finance and what finance buys for students) and the outcomes of student achievement. The initial description of this “complex system” that emerges from the Working Group’s study is but a first step towards a more comprehensive approach to public policy development.

### WORKING GROUP CHARGE

Section 31 of Act 156 of 2012 created “a working group that, in consultation with the James M. Jeffords Center for Policy Research at the University of Vermont, shall review and evaluate how Vermont’s current education system allocates financial and other resources in a way that promotes high quality, equitable educational opportunities for students throughout the state and how impediments to opportunity, such as poverty and substance abuse, may be mitigated.” It further provides that the “office of legislative council, the joint fiscal office, the office of finance and management, and the departments of education, of information and innovation, and of taxes shall assist the Working Group to identify the data required for its examination of the issues outlined in the section.

From the discussion of the Working Group and research compiled by the Jeffords Center, a discussion paper is to be written by the Jeffords Center and consultants on developing a statewide information and analytical system to support local and state decision making concerning the allocation of financial and other resources to achieve optimal outcomes from Vermont's education system<sup>16</sup>. This paper will:

- i. Address the need for a statewide information and analytical system and the impediments to implementing and managing a statewide information and analytical system in Vermont;
- ii. Evaluate Vermont's existing measurement and data collection methods for describing education funding and resource allocation as it relates to opportunities to learn (e.g. student enrollment in courses by level, teacher quality such as knowledge and performance, participation in career education, access to technology, and parent participation) and student outcomes (such as performance in courses by level, performance in career building experiences, test scores and work samples);
- iii. Recommend changes or additions needed to Vermont's existing measurement and data collection methods in order to adequately link spending to outcomes to support state and local decision making;
- iv. Review the analytical models best suited to a statewide information and analysis system and discuss specifically how these models would address the charge of the Working Group;
- v. Discuss the training, evaluative, organizational and policy needs for the implementation and management of a statewide information and analysis system in Vermont;

Produce a report that illustrates a model of how existing data on funding, opportunities to learn, and outcomes (as defined in ii) can inform local and state decision making.

The structure of the report is as follows:

- A Framework for Inquiry
- Opportunities to Learn
- Strategies to enhance Opportunities to Learn
- Funding and Spending
- Outcomes
- Special Education and Human Services: Interagency Collaboration
- Data Systems and Data Collection
- Return on Investment
- Recommendations to the Vermont Legislature and the Governor

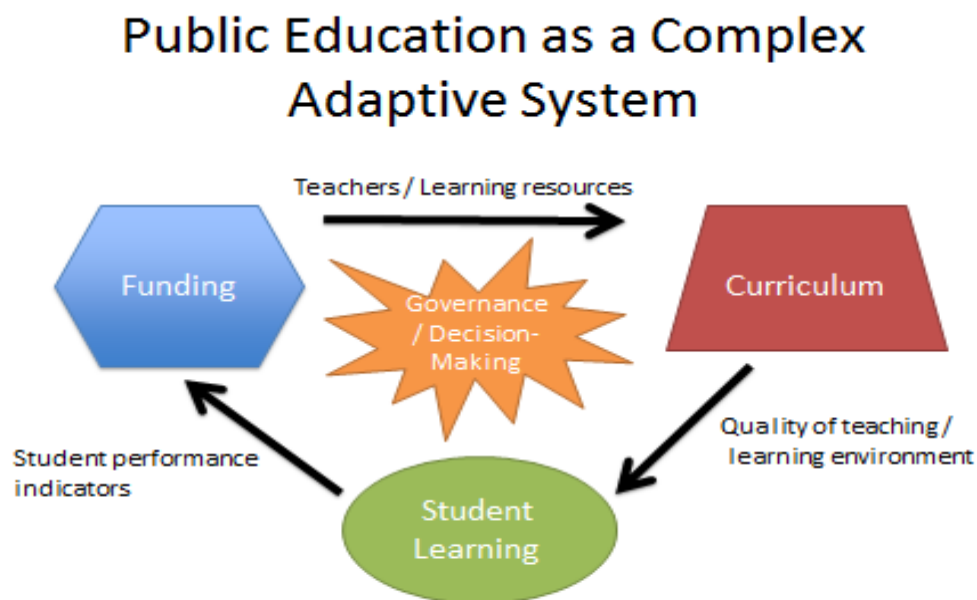
## A FRAMEWORK FOR INQUIRY

A general framework for inquiry has evolved from the legislation, testimony and review of the research on three elements for the deliberations of the Working Group:

- Opportunities to Learn made available to students (Curriculum)
- Outcomes of Schooling (Student Learning)
- Funding and spending

The relationship among these elements is described in Figure 1, below. It has been assumed that the educational system is the product of the interaction between and among the elements in a dynamic process of feedback where stakeholders in the system including students, parents, community members and policy makers react to changes in any one or more of the elements. Decisions that stakeholders make as individuals or collectively in a governance process directly or indirectly affect each of the elements.<sup>17</sup>

Figure 1



## THE NEED FOR TRANSFORMING VERMONT'S SCHOOLS

For the past decade, many states across the country have begun the arduous task of identifying how to prepare students for 21st century jobs and how to address the achievement gap that is

persistent among low-income students. The policy and implementation research is abundant and has coalesced around three major areas that are ripe for strategic development: 1) a rigorous and coherent curriculum and assessment; 2) teacher quality; and 3) student instructional support, including the development of individual pathways to post-secondary success.<sup>18</sup>

Strategies that states have developed can be categorized according to: 1) Increased academic rigor; 2) Proficiency examinations for graduation; 3) Use of data accountability for students, teachers, and programs; 4) State accountability and intervention systems for schools; 5) Supportive measures for students struggling in the system; 6) Improvements in teacher quality; 7) Improved linkages to post-secondary education and careers; 8) Community partnerships; and 9) Enhanced science, technology, engineering, and mathematics (STEM) education.<sup>19</sup>

One of the strategic lessons learned over the past decade in the improvement efforts is that a strong state systemic approach is critical to the success of education reform at the local level. Only the state can ensure that programs of quality, indicators of success, assessments, and talent are distributed in a manner that equalizes opportunity for all students.<sup>20</sup>

Forty-four states developed comprehensive plans for improvement and submitted them for the federal Race to the Top applications in 2009 and 2010. Nineteen states were funded. Thirty-three states have submitted and received federal waivers to progress from the No Child Left behind Act accountability system by developing a new generation of accountability measures aimed at tracking state progress on equal opportunity.<sup>21</sup> Vermont is the only state to have withdrawn from that waiver process.

These applications present a window into how states have organized to develop strong state systems in education. First, states have been actively implementing systemic improvements since the early 2000s. Second, the state systems that have been proposed vary in specifics, but contain the major elements, including funding, capacity, and management systems to ensure timely implementation.<sup>22</sup>

## HOW VERMONT IS ADDRESSING EQUAL OPPORTUNITY

Vermont has had several task forces and committees working on various aspects of a state strategy for equal opportunity in educational programs. In 2009 an Education Policy Transformation Commission created a report that focuses on many of the most important issues facing the Vermont education system. That document presents a vision of an education system that upgrades the standards and proficiency of Vermont students, addresses the achievement gaps among certain cohorts of students and re-designs education as an enterprise that responds to individual student ways of learning and opportunities for demonstrating proficiency.<sup>23</sup>

The Transformation Commission report describes the challenges for Vermont, including low rankings in teacher quality indicators,<sup>24</sup> outdated standards, lack of alignment between high school work and college requirements, and the lack of funding support for dual enrollment



programs.<sup>25</sup> Among the recommendations in the report is for the development of a regional system for managing education, a recommendation that responds to the difficulties in delivering high quality education to numerous small schools in a rural state.

The same report presents a plan for how the state should roll out the various elements of altered quality standards and other mechanisms. A number of task forces are to be established. The Educational Opportunities Working Group did not receive a sufficient review of the document or progress indicators to determine if progress has been made on this important and central planning document. We have heard incidentally that progress is being made on some of the recommendations. However, given the fact that at the time of the report (2009) the state was well behind many states in the implementation of strategic initiatives, it may be time to present an update of progress on the operational plan that documents the strategies with deadlines. The recommendations of the 2009 report are also reflected in the current Strategic Plan of the Vermont State Board and Department of Education (adopted August 18, 2010), which includes a wide range of strategies for improving education and equality of opportunity. A detailed implementation plan was presented as a draft in early 2011, but again it is not clear whether a formal evaluation of progress has been conducted.

A recent series of audits and case studies<sup>26</sup> indicates that many Vermont schools have been moving with vigor to determine how to address the achievement gap, but that they have been hindered by the short school day, the large number of standards that are to be taught, the profusion of professional development programs and offerings that offer various instructional goals, and uncertainty on the level of rigor and focus needed.

In a review of progress towards establishing career-and-college readiness systems in the New England States<sup>27</sup> Vermont lags behind in the areas identified in the Transformation Report: 1) defining career and college readiness; 2) linking and aligning high school standards and proficiency to college level requirements; 3) defining standards that have more rigor and focus on 21st century skills; 4) establishing dual enrollment or early college programs; 5) establishing a longitudinal data system; 6) requiring early career planning and links to internships; and 7) improving teacher induction, education, and evaluation.<sup>28</sup>

It is evident that Vermont's current educational system is not providing equal educational opportunity to all students.<sup>5,7</sup> Large percentages of students are not attaining proficiency needed to enroll and persist in the state's public colleges. The lack of at a post-secondary certificate or degree results in a lifetime of low wages and lost opportunities. Although the state has developed a visionary plan, the slow pace of implementation and the high stakes of that pace should be addressed.

## A FOCUS ON SCHOOLS AND SCHOOLING

Through testimony and review of state and national data and documents, the Working Group reviewed opportunities to learn, the need for a comprehensive data system, and funding systems. These reports have led to the following findings:

### OPPORTUNITIES TO LEARN

Among the characteristics of effective schools described above are the clearly articulated and accurately measured outcomes, focused and dynamic leadership and maximum and high quality time to learn. In the literature of school and teacher effectiveness perhaps no clearer description of the role of opportunities to learn in achieving the outcomes of schooling is found in a monograph attributed to Leigh Burstein and colleagues known as *Validating National Curriculum Indicators*<sup>29</sup>. Opportunities to Learn (OTL) are known as the ‘what’ of education. They include:

- Three levels of curriculum
  - The Intended Curriculum as specified in national, state or local standards for learning content
  - The Implemented Curriculum or, what actually gets taught to each individual student throughout the roughly 15,000 hours that they attend school from grades K to 12. This includes the text books, guides, course outlines that specify the level of content to be learned, computer programs, units of study, internship experiences. Implemented curriculum can be measured by identifying what specific courses each student has taken and linking that information to an individual student record with a unique identification number.
  - The Attained Curriculum or, what gets tested and reported for each student. (This measure of opportunity to learn is sometimes confused with the actual measurement of knowledge or skill that is possible for students. But, it is different from the tests because no single test can represent the full range of what may be learned by students.)
- The level of knowledge and skill that individual teachers employ with individual students (Students might learn quadratic equations from a computer program, but not from a teacher who doesn’t know that content or how to teach it.)
- Time to learn. There are three levels of time to learn. Only the most engaged time is directly related to learning outcomes.
  - Time in school (sometimes referred to as “seat-time”).
  - Time on Task (sometimes described as time spent in classes where content and skill are taught; better than seat-time at predicting outcomes)

- Engaged Time on Task with High Success. (This is the most predictive of student outcomes and can be measured by observing students engaged in high success tasks)
- Methods and techniques used by teachers to engage students in learning. In addition to the materials, time and knowledge base that teachers bring to the student's learning process in school, there are more and less effective means for both conveying knowledge and skill and engaging individual students in ways that most effective for their learning styles and learning modalities. The selection by teachers of methods and techniques of engagement is a powerful source of variation in students' opportunities to learn.

There are several references concerning Opportunities to Learn available on the Working Group Website: <http://www.leg.state.vt.us/workgroups/edop/>

Measuring opportunities to learn has been done by teachers, administrators and researchers with direct observation of teaching (expensive) and questionnaires to students and teachers about their school experience. The data that results from questionnaire measures can be linked to student characteristics, performance and school policy. For example, asking students about their experience with the extent to which teachers call on them in class can be compared with how students of varying races or income groups experience teacher support. The resulting analysis can then be compared with the scores on achievement tests students obtain and when grouped by student characteristics begin to reveal the distribution of opportunities to learn that may vary according to students' memberships in various groups. For example, students who tend to score in the lower ranges on standardized tests also tend to report that teachers do not call on them in class as often and these students tend to come from families with poverty backgrounds. It is then not unusual to discover that schools without policies that encourage teachers to treat all students equally are the locations where students report these discrepancies in teaching behavior.

In Vermont, as indicated above, we have sought to measure both the student experience of opportunities to learn and the characteristics of family background, race and disability as well as the outcomes of learning with standardized tests. Until the passage of No Child Left Behind, the outcomes of learning as measured with tests were not reported to the public according to students' membership in any of the groups mentioned above. After No Child Left Behind, test scores were reported for groups of students formed by income and disability. However, the collection of opportunity to learn data was discontinued in 2005.

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## FUNDING AND SPENDING

The collection and analysis of spending data from schools and school districts has been addressed by the Vermont Department of Education for several years in the form of annual statistical reports. The comparison of spending patterns across schools and districts has been difficult because of a lack of standardization in accounting and reporting practices across the districts. For example, the advantage in sharing costs across schools in large districts results in

some difficulty in assigning investment to individual schools. Line by line budget comparisons among schools do not enable the assessment of equity because of the variation in accounting practices and the needs to respond to local conditions. The Business-Education Alliance Report (2008) provides a succinct description of the problem:

*“Defining quality and measuring achievement and improvement of the educational system is challenging with the structures and systems that are currently available. The current state level fiscal metrics are based on outdated federal accounting standards.... Thus it is difficult to identify schools that may be realizing more efficient ways of delivering educational programs or improving the quality of their programs. At this time, the ability to conduct meaningful program evaluation and to gather relevant, usable data for system wide improvement is non-existent at the state level.” (p. 3-4)*

There are two major approaches to school funding that have implications for the equity of opportunity to learn. The first is to equalize taxing and spending power. Vermont’s model was recently reviewed in the “Picus Report” and found to be equitable. The second approach is to combine a distribution of state funding based on equitable taxation with a “needs” based approach to compensate schools with greater challenges with more resources. This could enable an assessment of how schools respond to the various challenges posed by local conditions. Vermont currently has a combination of these approaches with its distribution formula and some additional compensatory block grants for special education, vocational education and other areas such as migrant students from state and federal sources.

The Jeffords Center, upon reviewing methods of funding in use currently in other states, found no clear answer to the question of what allocation method might be used to obtain the maximum return for the investment of public funds in schools. The research also suggested that the method of allocation might be less important in achieving equity of opportunity to learn and outcomes than how the funds are spent to meet the needs of all learners. What we do know is that the law requires this determination to be made by the Commissioner of Education: (16 V.S.A., Section 164(17) State Board Powers and Duties (Act 60).

*“Report annually on the condition of education statewide and on a school by school basis. The report shall include information on attainment of standards for student performance adopted under subdivision 164(9) of this section, financial resources and expenditures, and community social indicators. The report shall be organized and presented in a way that is easily understandable by the general public and that enables each school to determine its strengths and weaknesses. The commissioner shall use the information in the report in determining whether students in each school are provided educational opportunities substantially equal to those provided in other schools pursuant to subsection 165(b) of this title.”*

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## OUTCOME MEASURES AND ACCOUNTABILITY FOR PERFORMANCE

Student outcomes are a major focus of educational improvement. The traditional measures of success, particularly in the accountability requirements of the federal law and Act 60, are standardized test scores. Other indicators include measures of goal and program success, such as graduation rates, college persistence, and employment statistics. Vermont has supported the development of both state level and local level standardized assessments. Graduation rates are reported by district and school but not by groupings of students such as income or poverty level, gender or race. Other outcomes such as college readiness as measured by application, acceptance and remedial skill rates are not at present reported. Part of the overall Department of Education plan is to support the development of local assessments and data systems that will inform parents, students and community of progress on a wide range of measures of student outcomes. Many districts are already doing this but it is not known how extensive or effective these efforts are at supporting local change.

- Measurement of outcomes has not kept pace with the research on how children and youth learn and the diversity of learning styles. Personalized learning,<sup>30</sup> while acknowledged as the most promising of opportunities to learn, has not been accompanied by the measurement of outcomes that may be employed to assess the extent to which all children who receive personalized learning benefit from the investment. A new system, called Smarter Balanced Assessment, is being implemented in conjunction with the adoption of the Common Core Standards. The Smarter Balanced Assessment is to replace NECAP testing by the 2014-2015 academic year.
- At the national level, the measurement of performance coupled with accountability for performance of all children in schools has generated a backlash from parents, school personnel, policy makers and students. The expectation in the law that all students will reach proficiency on standardized measures of reading and mathematics by 2014 and that there will be no difference in the performance of the sub-groups of students formed by the accepted measure of poverty level, has created systems of failure rather than success in the public schools.
- The collection and reporting of both opportunity to learn and outcome measures as indicators of system performance can generate enormous burdens on both the local and state administrative systems. Both the will to collect these data and an integrated and robust data system will be required to supply the information needed by schools to support the improvement of their practice and by the public and policy makers to judge the effectiveness of the educational systems. All elements in data systems should be justified by the extent to which they will contribute to improvement in opportunity to learn and outcomes.
- Recent reform efforts by the Vermont State Board of Education and the implementation of the Common Core standards needs to be represented in the new

data systems that are under development, so that learning opportunities can be measured and related to resources allocated and to educational outcomes.

## PERFORMANCE DATA AND ACCOUNTABILITY

The Working Group heard much discussion on the need to collect and analyze outcome data. Outcomes are important as measures of whether strategic goals and programs are being effective. There are several different types of outcome measures. Individual student outcomes such as test scores are a major focus of educational improvement. Beyond test scores, however, there are few individual student measures such as portfolio assessments, work samples or projects that are systematically reported and analyzed for patterns of equity. When aggregated at the program level there are other indicators that are measures of goal and program success, such as graduation rates, college persistence, and employment statistics. Student characteristics which provide groups to compare for equity include socioeconomic status, numbers of students eligible for free and reduced lunch, class size, teacher certification in taught subjects, etc. The determination of what outcomes and characteristics to collect depends upon the goals of the strategies employed for school improvement and to some extent by federal and state reporting requirements.<sup>31</sup>

The difficulty in measuring any one student's outcomes as a result of a certain instructional program is that confounding variables may affect the results. For instance, in measuring student performance as a result of a specific instructional program, confounding variables may be teacher preparation or quality, time on task, student attendance, instructional fidelity, socioeconomic or cultural status, etc. There are also issues involved in the form that evaluative measures take. Pencil and paper tests and multiple-choice tests are not always the best means to measure student proficiency.

The new state assessment consortia (PARCC and Smarter Balanced Assessment Systems)<sup>32</sup> are in the process of developing performance assessments that will be used as part of the state assessment systems related to the Common Core Curriculum. The need for measuring outcomes to determine program progress has been established after decades of measuring inputs and processes led to few positive instructional changes and mediocrity in the educational system.

In general, federal laws promoting equal opportunity have been designed to promote *access* to programs that might result in a leveling of the playing field, especially for those students from disadvantaged backgrounds. These laws have not specified that all student outcomes be equal. Because of normal variability in instructional programs and student characteristics, the No Child Left Behind Act has suggested that goals and outcome measures by states should demonstrate that *cohorts* of disadvantaged students are *making gains toward a proficiency goal* that has been defined by the state.<sup>33</sup> While this does not mean all outcomes must be equal, it does put pressure on states to move all students towards the proficiency standard.

The NCLB accountability system has been criticized, because the goals that states developed varied in rigor, the assessments varied in effectiveness, and the emphasis on one model of academic attainment did not fit all students. The U.S. Department of Education has offered states waivers from the NCLB accountability process to develop their own assessment systems, but maintains that states must continue to assess the progress of disadvantaged cohorts of students toward the goal of “college and career readiness.”<sup>34</sup>

The adoption of the Common Core<sup>35</sup> curriculum has led to a consortium of states (including Vermont) adopting the Smarter Balanced Assessment System<sup>36</sup> which will continue to assess the progress of cohorts of students towards the CCR goal, but will also offer schools interim or formative assessments closely related to classroom instruction. This information will inform teachers and administrators whether individual students are mastering the curriculum and whether students are making progress along the education pipeline. This information makes it possible to develop options for students to progress along differing pathways towards proficiency, a goal of the Vermont Transformation Plan.

Outcome measures for students, programs, and teachers must *be attached to the systemic state goals*. Without a specific operational plan it is difficult to identify the outcomes measures that would be most effective in charting progress. The Vermont Department of Education has many aspects of a complete longitudinal data system in place. The Department recently received a federal grant to improve the system. Testimony by the Department and local officials illustrated the difficulties in interfacing different databases in an effort to develop a uniform system.

It is clear that a comprehensive data system is the structural backbone for all Vermont improvement efforts. Without such a system, the impact of many of the Vermont strategies cannot be evaluated.<sup>37</sup> The evaluation of students, teachers, and programs is a critical aspect of efforts to deliver more equitable programs to students across the state.

As the state completes its data collection system there is a particular concern about the extent to which data collection functions are pushed down to the local level, where time spent on clerical work is time subtracted from student instruction. Each set of data collected should be connected to the state plan and should be necessary for the operations of the instructional goals. Some consideration might be given to limiting the data that must be sent to the state and keeping instructional information at the school or supervisory union level.<sup>38</sup>

## OPPORTUNITIES TO LEARN (CURRICULUM, INSTRUCTION, TEACHER QUALITY, TIME)

Opportunities to learn (OTL) can be defined and measured narrowly as the time engaged in successful learning, courses of instruction, methods such as personal learning or large classes, and access to learning tools such as computers that are experienced (or not) by each individual student.

Opportunities to learn can also be defined and measured broadly at the level of the school such as the quality (knowledge and skill) of the teachers in each curricular area, the diversity of curricular offerings, dual enrollment with colleges, school family partnerships where parents are engaged in student learning, flexible grouping, assessments that cover a wide range of knowledge and skill, and school/community partnerships for service learning. The conditions in the community and school that support opportunity to learn can also be included in the broad definition. For example, pre-natal care to support healthy birth with positive neurological outcomes, adequate nutrition throughout early childhood and school years, family supports to reduce stress are all contributors to the success that children may have in school and beyond. Vermont once measured these indicators of support with the Community Indicators project of the Agency of Human Services.<sup>39</sup>

The measurement of opportunities to learn can also be done by collecting and reporting curriculum data, teacher evaluation information, and the extent of best practice observed by schools in the same areas listed above. At least some of these factors are currently being measured by the ongoing SECT data collection, and some will be measured in the student longitudinal data system (VADR) that is currently in development. Others were measured and reported in the Department of Education's report, *Roots of Success: Effective Practices in Vermont Schools* (2009).<sup>40</sup>

Opportunities to learn can also be reliably measured for individual students through survey questionnaires administered during assessments. These data can be used to tabulate the relative distribution of opportunities among the various schools, districts, and groups of students according to income, gender and race. This was done by the Department of Education for each student in the state from 2000 through 2004 on an annual questionnaire attached to the annual state assessment, the New Standards Reference Examination. This survey measured seven factors associated with school effectiveness, developed from the research on Effective Schools done by Ronald Edmonds (1979)<sup>41</sup> and Wilbur Brookover and Larry Lezotte (1979)<sup>42</sup>:

- Focused and dynamic leadership,
- Clear school mission focused on academics
- High expectations for all students
- Clearly articulated and accurately measured outcomes of curricular objectives,
- Safety and security of the school,
- Maximum and effective time to learn, and
- Parent engagement.

The Working Group was provided with preliminary data extracts which allowed us to compare the distributions of certain measures of opportunity to learn with achievement in mathematics across the state by district as maps, as well as a preliminary analysis of the relationships among the OTL measures, performance in mathematics, teacher salaries and district spending. These



findings, presented below, suggest that there is still considerable variability of educational opportunities across the state. Further, we found that OTL is positively associated with mathematics achievement across supervisory unions, and that although poverty is a factor at least in some cases, these differences are not strongly (if at all) associated with spending levels. The following table summarizes the data elements considered in this report.

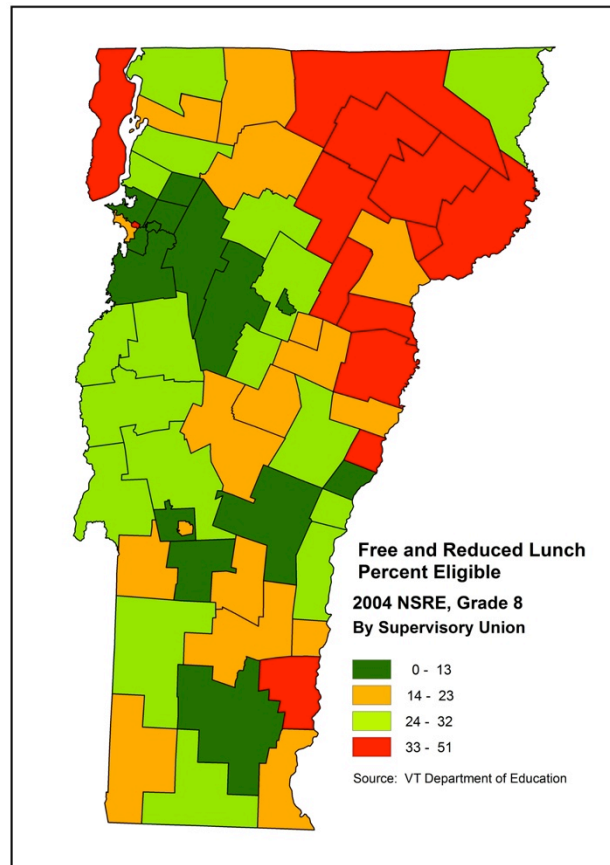
SUMMARY OF DATA ELEMENTS USED TO MEASURE OPPORTUNITIES TO LEARN

<i>Measurement Type</i>	<i>Data Elements</i>	<i>Status</i>
<b>Financial</b>		
Annual Statistical Reports of Schools	Total spending Direct Instruction costs Administrative costs Transportation costs	Compiled annually
Development of common chart of accounts (specific elements not yet defined)	Educational technology costs Spending by subject area Physical plant operation Core curriculum costs Non-reimbursable Special Ed costs Extracurricular activity costs	Mandated by Act 153; in development
Links to other agencies	School based health services (Medicaid)	Maintained by AHS
<b>Curriculum</b>		
Annual assessments	Test scores reported by Department of Education (NECAP, Smarter Balanced)	Conducted annually
SECT (Student Educator Course Transcript)	All courses taken and grades earned; data linked to students and teachers	In progress
Survey of graduation requirements	High School courses required for graduation	Survey conducted Spring 2012 by Dept. of Education
VADR	Data system for storing and collecting SECT data. (Student Longitudinal Data System)	In development
<b>Opportunities to Learn</b>		
Access to Pre-K programs	Enrollment in publicly funded programs (Department of Education) Program licensing and STARS quality data (Child Development Division)	Some data available through Building Bright Futures Early Childhood Data Reporting system
Survey during annual assessments	Student perceptions of school environment, teacher expectations, and classroom experiences.	Not measured since 2004
School Quality Standards	Standards under revision	Not measured

## ANALYSIS OF OTL SURVEY DATA

The distribution of Opportunities to Learn to students across Vermont schools and school districts is uneven. That is to say, the measures we have of OTL each show that some school districts (and thus some schools) provide higher levels of opportunity than others. The uneven distribution by school district is cause enough for concern on a geographical basis, but the effects of lower levels of OTL are more serious for low income students than they are for others. The gaps in performance between low income and other students (which average thirty percentile points on nearly every measure of performance) are highly related to the geographical distribution of income. The map on the right shows how eligibility for free or reduced priced lunch is distributed geographically across Vermont school districts. As you learn about the distribution of Opportunities to Learn below, keep in mind that low opportunity to learn is related to low income distribution.

As previously described, the Vermont Department of Education conducted a survey of Opportunities to Learn (OTL) in 2004, as part of the New Standards Reference Examinations (NSRE). The data from each student's assessment of his or her opportunities to learn in 2004 were provided by the Department of Education in aggregate form for analysis and comparison with district spending and student performance in mathematics. Preliminary analysis was conducted at the Department of Education, and data were provided for further analysis in aggregate form (by supervisory union). Detailed statistical tables and discussion are presented in the Appendix. These technical materials include a more detailed description of the procedures and variables used in the analysis, and a complete equity analysis based on the OTL data.



Each question in the OTL survey was presented in the form of a statement, for example, “I am often asked to judge the quality of my school-work”. Response options included “Not at all”, “A little bit”, “More than a little”, and “A lot”. The 24 questions (23 questions for middle and elementary school students) were combined to form a scale using the 4-point metric used in the survey.

Reliability was high for all grade levels, ranging from  $\alpha = .86$  among 4<sup>th</sup> graders, to  $\alpha = .91$  among 8<sup>th</sup> graders and  $\alpha = .91$  for 10<sup>th</sup> graders.

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## OTL AND ACADEMIC PERFORMANCE

The relationships among opportunities to learn and student performance are well documented in the literature on school effectiveness. How opportunities to learn are distributed across the various schools and school districts has also been investigated. For example, Morgan (2005) found a direct relationship between student performance on state assessments and the access students had to learning opportunities such as portfolios in mathematics and writing as a consequence of student mobility. She found that from 2001 through 2004, 15,000 students moved from one school to another each year. Ninety-two schools out of 306 gained or lost twenty-five percent of their enrollments. Students who had changed schools reported significantly less experience with portfolios than those who had not moved. When curriculum varies widely among schools the effects on newly arrived students are dislocating and their achievement is typically lower.<sup>43</sup>

To assess the relationship between OTL and academic performance, we used multiple regression analysis to control for factors such as gender, ethnicity, poverty, and total per-pupil spending. Descriptive statistics for each variable are shown in the Appendix.

Multiple regression analysis allows us to identify the influence of several factors at the same time on mathematics performance outcomes. In this case, we examined the relationship between student-reported OTL and the percent of students meeting the overall mathematics standard, after taking into account (“controlling for”) the distributions of gender, ethnicity, free / reduced lunch status, and per-pupil spending (details shown in Appendix).

For each grade level the model accounts for a substantial proportion of variability in percent of students meeting the math standard. For example, more than half of the variation in math performance among 8<sup>th</sup> graders (56%) is accounted for by OTL, gender, ethnicity, poverty status, and per-pupil spending. The impact of poverty as measured by free / reduced lunch eligibility is most evident among grades 4 and 8, and independent effects for per-pupil spending were only evident among students in the 8<sup>th</sup> grade.

*The relationship between OTL and mathematics achievement is significant and substantial at all grade levels.* For every 1-point increase in mean ratings on the 4-point OTL scale, the expected percentage point increase in a supervisory union’s students meeting the math standard is 44 in grade 4, 38 in grade 8, and 26 in grade 10.

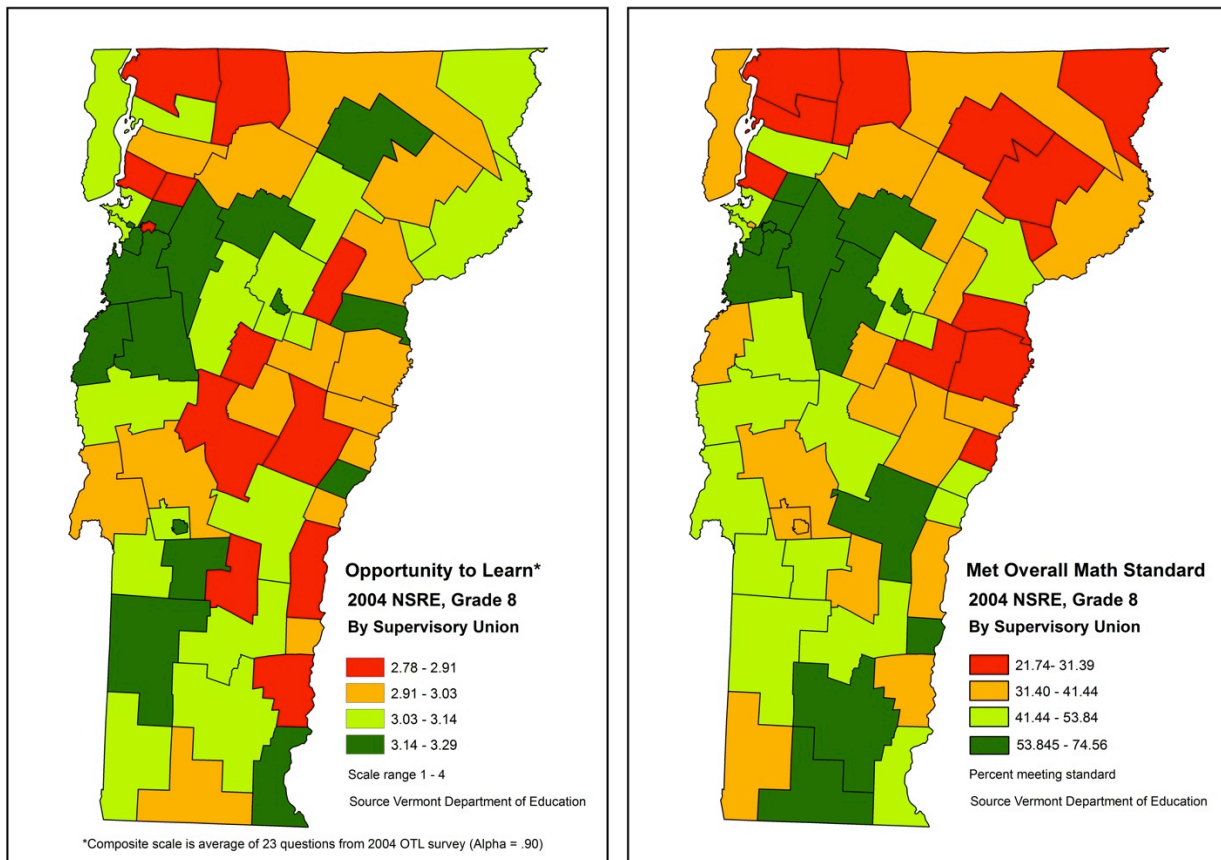
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## ARE OPPORTUNITIES TO LEARN EQUITABLY DISTRIBUTED?

The maps on the following page show the considerable variation of mean OTL scores by supervisory union, followed by mathematics performance as measured by percent meeting

overall standard. In both cases these are shown for 8<sup>th</sup> grade students. Supervisory unions are color-coded to provide a high-level view of variability, with low scores shown in red and high scores shown in green. OTL appears to be highest in the most populous areas. The pattern for mathematics performance is more complex, ranging from a low of 21.7% in St. Johnsbury to a high of 74.6% in South Burlington.

To evaluate the extent to which OTL varies by supervisory unions, and the implications of any variability, we compared results for the high and low rated 10<sup>th</sup> percentiles by dividing the mean for the 90<sup>th</sup> percentile group by the 10<sup>th</sup> percentile mean (details shown in the Appendix)<sup>44</sup>. The 5 supervisory unions in the 90<sup>th</sup> percentile OTL ratings had OTL scores that were 1.2 times higher than those in the 10<sup>th</sup> percentile. Although this ratio appears small, it is equivalent to a substantial proportion of the overall range in OTL, which is based on a large set of questions. The impact of OTL dispersion can be seen in the equivalent ratios for the percent of students meeting the overall mathematics standard. Across all grades, the *students in the highest rated 10<sup>th</sup> percentile of supervisory unions (for OTL) met the standard at 1.4 – 1.6 times the rate for the lowest rated 10%, with differences of about 20 percentage points for each grade.*



Additional review of the data showed us that *some of the highest rated supervisory unions for OTL may actually be spending less money than the lowest rated ones*. The following table lists the supervisory unions in the high and low 10 percentiles, along with their 2004 per-pupil spending (2004 spending selected for comparability with the OTL survey data). In grades 8 and 10, there are low-spending SUs in the top OTL decile. In grade 8 this is Chittenden East (\$9,433), and in grade 10 this is Franklin West (\$8,910). Similarly, there is at least one high spending SU among the lowest OTL ratings (Windham Northeast, again for grade 8).

**Supervisory Unions in 90<sup>th</sup> and 10<sup>th</sup> Percentiles for OTL, with Per Pupil Spending**

	<i>10 Percentile OTL (Lowest to Highest)</i>	<i>Per Pupil Spending (Mean)</i>	<i>90 Percentile OTL (Highest to Lowest)</i>	<i>Per Pupil Spending (Mean)</i>
<b>Grade 4</b>	Battenkill Valley	11,287	Orleans Central	11,609
	Essex North	11,152	Blue Mountain	11,254
	Orange North	10,600	Winooski	10,280
	Addison Northeast	10,700	Rutland Windsor	12,831
	Rutland South	10,434	Hartford	10,160
	Montpelier	12,100	Rutland Northeast	12,337
<b>Grade 8</b>	Washington South	10,473	South Burlington	10,546
	Windsor Southeast	10,768	Rutland South	10,434
	Washington Northeast	12,278	Bennington Rutland	12,696
	Rutland Windsor	12,831	Chittenden East	9,433
	Windham Northeast	14,668	Lamoille South	10,006
	Milton Town	9,766	Orleans Central	11,609
<b>Grade 10</b>	Windsor Southeast	10,768	Burr & Burton Acad.	12,696
	Franklin Northeast	10,371	St. Johnsbury Acad.	10,301
	Windham Northeast	14,668	Chittenden Central	11,707
	Orange North	10,600	Franklin West	8,910
	Orleans Southwest	11,670	Hartford	10,160

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## HOW ARE INDIVIDUAL OTL ITEMS DISTRIBUTED?

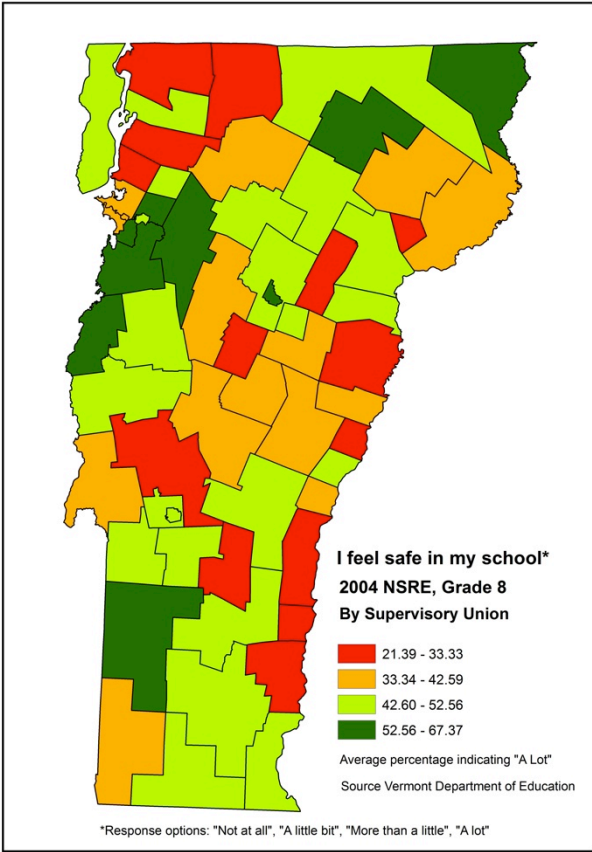
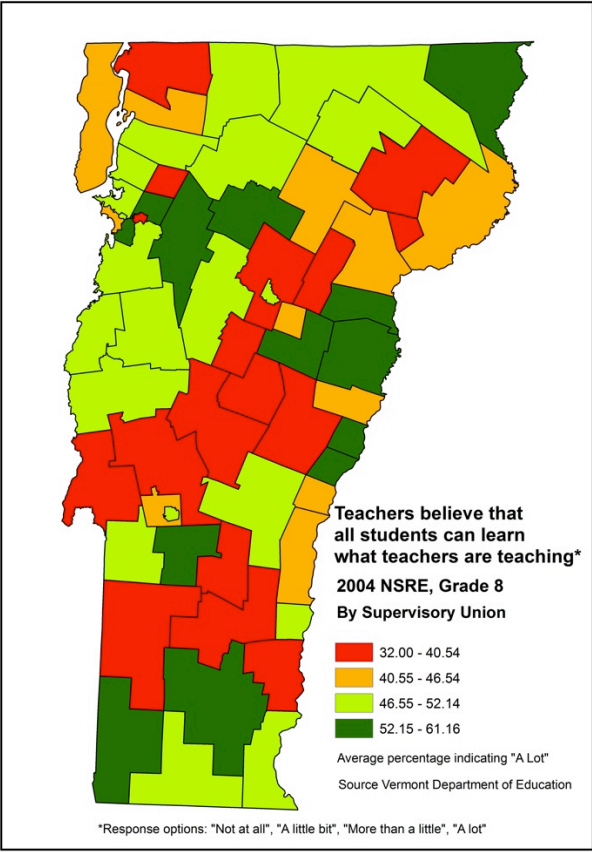
We selected three questions from the OTL scale to illustrate the degree of dispersion for a variety of scale components:

- My school-work is evaluated with written projects, oral reports, portfolios or performances.
- Teachers believe that all students can learn what teachers are teaching.
- I feel safe in this school.

As shown previously for OTL, mathematics performance and per-pupil spending, we calculated decile-based dispersion ratios for each of the single-item examples. These percentages differed considerably between the high and low 10% of supervisory unions on OTL, ranging from 1.28 (8<sup>th</sup> grade, evaluation by project work) to 2.34 (10<sup>th</sup> grade, feel safe in school). *Of the 10% of supervisory unions rated highest on OTL by 10<sup>th</sup> graders, the percentage of students selecting the highest rating (“A lot”) for the question “I feel safe in this school” was more than double that for supervisory unions rated in the bottom 10% for OTL.* Additional supporting results, including Coefficients of Variation and graphical representations of dispersion, are presented in the Appendix.

The following maps show the mean percent of “A lot” ratings for two example items by supervisory union, again for 8<sup>th</sup> grade students. As in the previous example, supervisory unions are color-coded to provide a high-level view of variability, with low scores shown in red and high scores shown in green. One observation that can be made about these distributions of opportunities to learn is that there is considerable similarity in the patterns of students’ ratings. That is, certain areas of the state appear to have “better opportunities to learn” as measured by the level of expectations that students sense their teachers have of their potential. The patterns of these ratings are similar when related to safety and the frequency of the use of “inquiry” type of teaching methods.





## PRE-KINDERGARTEN PROGRAMS

The importance of pre-Kindergarten (Pre-K) school educational opportunities for later achievement is profound and lasting. For example, Reynolds et al.<sup>45</sup> reported from a longitudinal study of low income children that long term outcomes associated with Pre-K included higher rates of high school completion (50% vs. 39%) and lower rates of juvenile arrest (17% vs. 25%). These benefits occur across the age spectrum, including improved kindergarten readiness, better reading achievement in third and eighth grade, and reduced risk of grade retention at age 15.<sup>46</sup>

Program quality is recognized through the voluntary STARS (Step Ahead Recognition System) system, with ratings ranging from one STAR to five STARS depending on program practices and improvements. Pre-K programs in Vermont are provided by a combination of public schools, licensed centers, and registered home providers. Vermont's Act 62 of 2007 specified requirements for providers to receive public funding, including accreditation, achievement of a 4 or 5 STARS rating, or a 3 STARS rating with an approved plan for achieving a 4 STARS rating; providers must also have a licensed early childhood educator on staff. This has resulted in the substantial increase in the numbers of providers seeking and obtaining ratings of 4 or more STARS, and consequently the numbers of high rated providers available to families. It is less

clear whether the increase in highly rated programs reflects real changes in practice, or simply that the recognition programs were already providing high quality services.

According to the Building Bright Futures State Advisory Council, the proportion of licensed centers with a rating of three or more STARS grew from 16% in 2007 to more than half (51%) in 2011. Enrollments in publicly funded pre-K programs have increased in recent years. Although there has been an increase in the proportion of children cared for by programs rated 3 STARS or higher, there has not been equivalent growth among registered home providers, of whom only 9% were rated with three or more stars in 2011. Affordability continues to present challenges to families. In the same report, preschool costs for a family of four with two preschool-aged children were estimated at \$17,800. The same family would have needed to earn no more than \$22,045 to qualify for the maximum level of assistance. Shortages of qualified educators were also reported; Building Bright Futures estimated that no more than 432 ECE or ECSE qualified educators were actually providing services in 2010, whereas there were approximately 46,000 children in Vermont aged 6 and younger.<sup>47</sup>

The Building Bright Futures Council has developed a prototype Early Childhood Data Reporting System (ECDRS) to track, integrate, and disseminate critical data on Vermont's strategic investments in its early childhood infrastructure. The Council assisted us by compiling data from the Vermont Child Development Division, representing all regulated care and education programs, including data on licensing status, receipt of public education funding through Act 62, and STAR ratings. Enrollment data were provided by the Department of Education. The maps below show total pre-Kindergarten enrollment from the October 2011 census, the number of licensed programs, the numbers of programs with high (4 – 5) STARS ratings, and the number of programs receiving public education funding through Act 62. All data were aggregated by Supervisory Union.

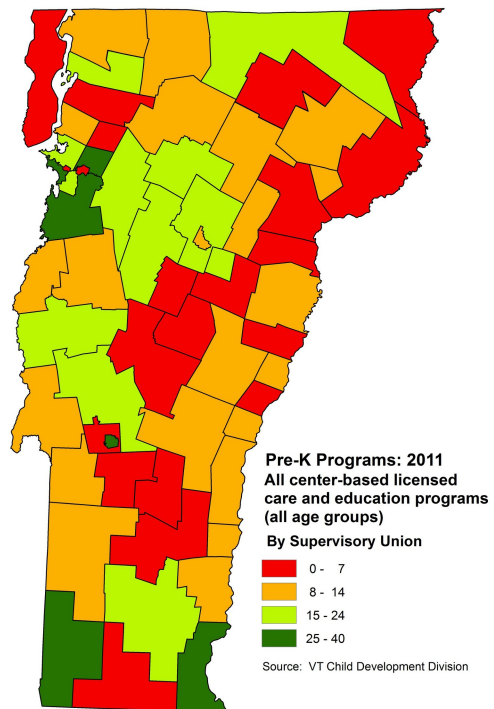
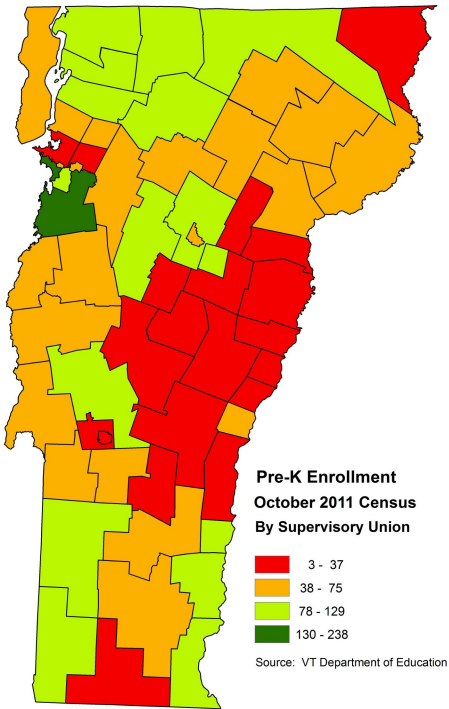
Implications of the maps include:

- Considering the distribution of *enrollment*, the numbers shown on the map are roughly in accord with the distribution of the general population. Notable exceptions include Rutland, Colchester, and Essex. The *number of licensed programs* (including all school based programs) follows a similar pattern, but in this case it can be seen that some areas with apparently low enrollment are better represented in terms of the numbers of programs (Rutland City, Essex, and Colchester). Licensed programs serve all age groups (infants, toddler, preschool and school age), from 6 weeks up to 13 years of age.
- *Public education funding* appears to be mostly concentrated in Burlington and Southeast VT, and appears to be low in the population centers of Rutland, Bennington, Colchester, Milton, Montpelier and St. Johnsbury. The map does not reflect the amounts of funding – only the number of programs receiving any public funding. The discrepancy is a result of local decision making and reflects the priorities afforded to pre-K education and community based child care partnerships. Highly rated programs are concentrated in major population centers,

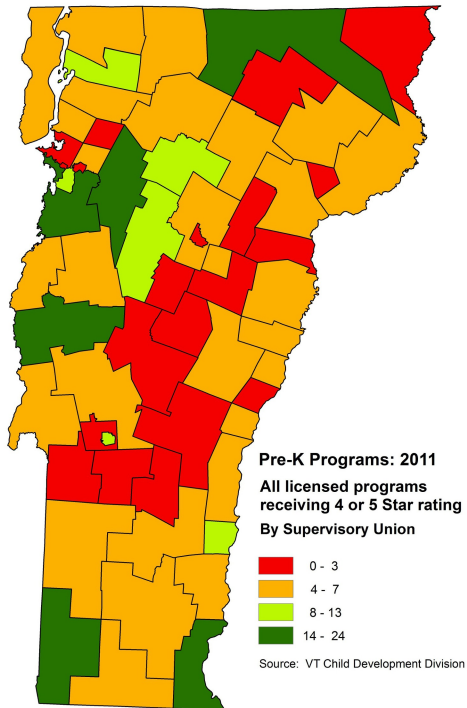
but again are less well represented in Colchester, Winooski, Essex Junction, Montpelier, and St. Johnsbury. Bennington and Essex are reportedly developing new partnerships with community based programs, which may increase the numbers of programs receiving public funding in these areas. The top three SUs for receipt of public funding are Burlington with 13, followed by Windham Southeast (10) and North Country (8).

Because Pre-K is voluntary and not all towns participate in the provision of publicly funded programs, the relationships between program availability, public funding, and school participation are complex. It appears that while Act 62 has provided important motivation for providers to obtain 4 or 5 STARS ratings, the distribution of programs receiving public funding is far from equitable, and the decisions of communities such as Colchester and Rutland against providing Pre-K have a profound effect on the availability of programs.

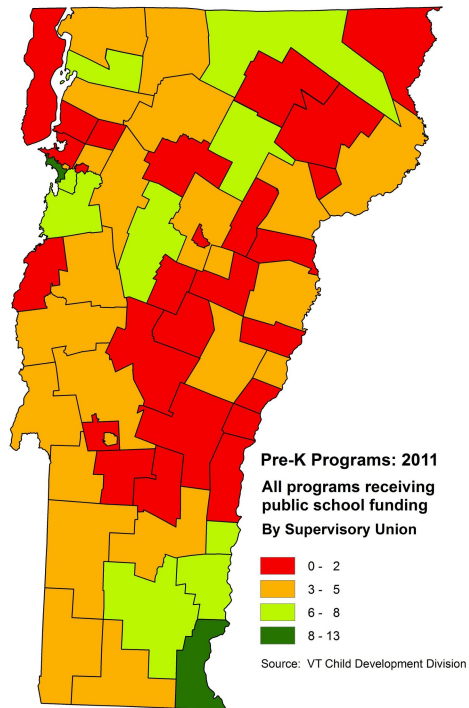
There are potential synergies between initiatives such as Building Bright Futures, Home Visiting, Community Health Centers, Patient (Pediatric) Centered Medical Homes and other VDH programs, which could be matched with other AHS supports, school health programs and other initiatives to help level a playing field that is currently tilted by variable decisions by communities, the availability of licensed childhood educators, and the complexity of the funding and regulatory system.



Data provided through the Building Bright Futures Early Childhood Data Reporting System



Data provided through the Building Bright Futures Early Childhood Data Reporting System



Data provided through the Building Bright Futures Early Childhood Data Reporting System

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## SUMMARY OF QUANTITATIVE FINDINGS

- The 2004 OTL survey provides the best available data on the distribution and equity of educational opportunities in Vermont, and a highly reliable measure of the OTL concept. However it must be kept in mind that all OTL data reported are from 2004 (8 years ago).
- There is a direct relationship between students' judgments of their opportunities to learn and the scores they obtain on the state assessment in mathematics. OTL strongly predicts mathematics performance, even after accounting for poverty status, per pupil spending, and demographic factors; this result demonstrates the validity and importance of the OTL concept.
- There were notable discrepancies between the high and low 10% of Vermont's supervisory unions on opportunities to learn, with mathematics performance in the top decile 1.4 – 1.6 times that of the bottom decile.
- By the same comparison there is minimal variation of per pupil spending. Among 8th graders, there is also a positive relationship between the investments that districts make in instruction and student outcomes (See Mathias, 2009).<sup>48</sup> These relationships are clearly present even after the level of poverty and per-pupil spending in each district is held constant.
- There were low-spending supervisory unions among the top 10% in OTL; conversely there were high-spending supervisory unions among the bottom 10%. Although this makes it difficult to use these data to assess the relationship between the allocation of resources and educational opportunity, it does not mean there is no relationship. Rather, it suggests that the relationships are complex and may vary according to local conditions..
- Coefficients of variation must be used with caution because the OTL scale's high reliability means that it also has a very low standard deviation. However, examination of selected component questions shows moderately high levels of dispersion, with decile dispersion ratios between 1.3 and 2.3 and CV values as high as .33. Dispersion as measured by CV is very high for both poverty status and mathematics performance.
- Despite recent progress, the availability of high quality Pre-K programs is uneven across Vermont, and consequently the availability of public funding is also uneven. New ways are needed to encourage communities to offer Pre-K, and to increase the availability of qualified early care and education programs as well as the numbers of licensed educators providing early education services in Vermont.

Assuming the will to make the investment at all levels of the educational system, what strategies might be employed in order to provide a more equitable distribution of opportunities to learn? A review of state employed strategies from 2006 – 2012 provides one set of answers that stakeholders might consider:<sup>49</sup>

### **1. Graduation proficiency standards and assessments**

- End of course assessments standardized across the state.
- Graduation tests: ACT, SAT, state assessments.
- Passage of industry standards for technical programs.
- Portfolios and graduation projects.
- Benchmark assessments and intervention programs along the pipeline.
- Career planning begun in 6th grade.
- Increased state requirements for academic rigor and common state-wide curriculum for all students.

### **2. Accountability Standards for Low Performing Schools**

- Development of standards for accountability based on student performance, graduation rates, retention rates, teacher quality, the ability to effectively teach the Common Core curriculum to all students.

### **3. Comprehensive state strategy for student support**

- Strategic state support system for at-risk schools and students.
- Incentives for high quality teachers to teach in rural or urban districts schools.
- State grants for AP courses, after-school programs, preschool programs and online programs for schools with limited resources or at risk students.
- Benchmark assessments and intervention along the pipeline.
- Career planning by 6th grade.
- Extended school year and day.
- Connections to the family, community, and human service/health system.
- State system of dual enrollment or STEM technical schools with a smooth transition to community and state colleges.
- Standardized entrance requirements for all state colleges.
- Automatic college entrance for passage of state defined rigorous curriculum and end of course assessments.
- College and career counseling for all students.
- Sufficient support for ELL programs and for schools affected by large numbers of ELL students.
- Incentives for low income students to transition to college or technical programs.

- Improvement of instructional strategies, including those for ELL and at-risk students and more project oriented programs.

#### **4. Data Systems**

- Complete student and teacher longitudinal data system.
- On-line professional development and resource libraries that include sample lessons related to the common core and STEM areas.

#### **5. Teacher Quality**

- Enhanced requirements for students entering teaching programs.
- Enhanced rigor in teacher preparation programs (state-wide) to reflect the Common Core.
- Enhanced licensing requirements, especially in elementary STEM areas.
- State teacher induction and mentoring programs.
- Teacher evaluation systems that reflect student performance.
- A coherent state strategy for professional development.
- Teacher preparation pre-service fellowships for rural or hard to staff schools.
- Incentives for talented undergraduates to study teaching and teach in hard-to-staff areas, including STEM, special education, rural schools and schools with a large number of ELL students.

#### **6. Career and Technical Education**

- Upgrading the CT curriculum to include the Common Core standards.
- Developing early college schools that provide an Associates Degree and a high school degree as well as industry certification in five years of high school.
- Working with high schools and community colleges to ensure that students are prepared for the rigor of college work, especially in writing and STEM areas and facilitating the transition to college.
- Developing career planning by 6th grade.
- Development of a state WEBSITE for career and college planning.
- Requiring students to take coursework or to participate in at least one career internship or practicum.
- Partnering with business to develop state-of-the art career and technical programs, develop career clusters, and provide internships.

#### **7. Enhanced state STEM programs with public/private partnerships.**

- P-16 Council that includes higher education, executive and legislative members, P-12 education, business, and community members.
- A focus on coordination of state systems to improve workforce development.

- Increased rigor and academic requirements in STEM courses.
- Improvements in STEM teacher preparation and required student curriculum.
- A statewide resource system for teachers in STEM areas.
- Enhanced preparation in mathematics and science for elementary teachers.
- State coordination of professional development in STEM areas with a timely strategy for improving teacher competency in this area.
- Coordination of individual efforts and public/private partnerships to provide a more coherent structure for improvement.

## A BASIC ASSUMPTION ABOUT EQUITY

A basic assumption concerning the equity, or rather the equality of educational opportunity to learn, is that all students will have access to the full range of opportunities to learn that result from the strategies named above. If students, parents, school district personnel or the state were to measure the access of students to those opportunities to learn that are directly linked to the outcome measures discussed below there should be no significant difference between and/or among groups of students formed by their backgrounds with respect to the choice of opportunities to learn. For example, if access to higher levels of mathematics knowledge is dependent upon students having the opportunity to learn algebra there must be complete and open access to algebra for all students.

There may be a very few exceptions to this assumption, but successful educational systems such as Finland and Singapore maintain maximum access for all students.

## FUNDING AND SPENDING

Funding and spending are two related, but different constructs. That is, funding is normally described as the gathering of resources from taxes and other sources of funds in order to provide the basis for the distribution of the funds to the system (states, districts and schools) and the eventual allocation of these resources (spending) at all levels of the system from states to classrooms to individual students. We don't often extend the analysis of spending down to individual students (such as Individual Education Plans or tutoring), but in so far as the measures of student outcomes such as graduation, test scores, performance in internships, and work samples are collected at the individual student level it may make sense to think of the allocation of funding and spending in terms of how much of that resource can be attributed to the educational experiences (Opportunities to Learn or Curriculum) of individual students.

The discussion of funding and spending is often presented in terms of “fiscal equity.” (Toutkoushian and Michael, 2007) Researchers in the area of school finance identify two dimensions to the equity or fairness problem:



- Horizontal Equity, (equal spending power) familiar to readers of Vermont’s Act 60 and subsequent modifications and the more recent Picus Report (2012)<sup>50</sup> which describes Vermont’s relative success in equalization of spending power.
- Vertical Equity is a concept less familiar to most citizens. This concept describes the “compensatory” allocation of resources to districts, schools and students that provides the basis for meeting the needs of students that are beyond the “normal” range of needs that are assumed to be present for all students in horizontal equity distribution schemes. Title I of the Elementary and Secondary Education Act (No Child Left Behind) is a prime example of the attempt to supplement the horizontal distribution of funds in order to give additional support to students who need help in order to achieve basic outcomes. Special Education aid, migrant aid and federal impact aid for defense department impacted areas are other examples of compensatory spending at the federal level. States sometimes supplement horizontal allocation with special grants for small schools whose formula allocations are insufficient to overcome the increase in costs to provide the “equalized” level of support that approximates the resource allocation gained in economy of scale by larger districts.

Embedded in the distinction between horizontal and vertical equity is the issue of “adequacy.” Adequacy has been the subject of both academic inquiry and litigation. The extension of the horizontal/vertical distinction of funding and spending to the relationship between the resources provided and the outcomes obtained is the nexus of the problem considered by the courts and policy makers in the search of the equity of outcomes obtained by the system or, the overall test of the purpose of public education in the democracy. This test seeks to answer the question: Can public education supply the means to obtain access to personal success in the society that levels the playing field for students who are poor, disabled, or otherwise disadvantaged in any way not directly related to ability? It is the latter distinction, “ability” and its measurement coupled with the calculus of how much additional effort is required to compensate for the identified challenge that makes the identification of adequacy so difficult. Add to the nature of the challenge the fact that many challenges, for students, come in bunches, like grapes. Further, some combinations of certain challenges add up to more serious implications for adequacy than others. The combinations are not always apparent.

Adequacy is at the center of the concern about the relationships among funding/spending, opportunity to learn and outcomes. It is because the selection and support of opportunities to learn (such as the length of time that some students need to learn certain concepts or the level of skill of the teacher required to adequately diagnose and remediate the combination of learning challenges) will require different levels of spending and this requirement is ever changing in real time. The complexity of this system is at the level of the individual student, where the learning takes place and the outcomes are determined.

## FUNDING APPROACHES

In the literature of education funding approaches there are three perspectives that have emerged over the past five decades: activity-based funding that describes the “per-pupil” allocation of funds to schools and school programs, and, outcomes-based or performance-based funding and efficiency-based funding. Each of these is examined in the Vermont context, below.

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### ACTIVITY-BASED FUNDING.

The allocation of funds to school districts and schools has historically been driven by the number of students to be taught. The calculation of per-pupil costs has been at the center of the conversation about efficiency. Attempts to combine school districts and schools in consolidation initiatives, particularly in rural states like Vermont have often been justified by the economy of scale arguments wherein more efficient and effective high quality programs are assumed to result by the creation of larger units upon which to base school activity like teaching and learning. In the literature of school finance these approaches are known as “activity-based” funding and are sometimes compared to the “fee for service” models of funding health care which provide funding for services rendered. Also known as “incremental funding” the enrollment numbers driven funding tends to increase funding levels slowly. Two problems experienced historically with this method are that as costs of goods and services in the larger society increase the relative funding levels that are indicated by enrollments do not decrease as expected when enrollments drop; and, the needs of students who are mobile may alter the demand on resources without changing the numbers of students overall.

A major question concerning activity based funding is the extent to which the allocation of funds actually results in the higher quality of educational experience and resulting outcomes when economies of scale are reached. In Vermont, assuming that the general goals of fund allocation among the various districts and schools have been progressively equalized we might expect the correlation between spending and outcomes to decrease over time. That is, the correlation between spending and outcomes would decrease as the variation in spending likewise decreased. But, as Woolf and Heaps (2012),<sup>51</sup> observed, this has not happened to any great extent. The relationships among spending and student test scores has remained at about zero all during the decade they studied. One of the reasons they cite for this lack of change in the relationship is the fact that in their data the actual narrowing of the variation in spending did not continue through the latter part of the last decade. That is, disparities continued to develop in the data they were using for the comparisons. This finding is somewhat different than the conclusion reached by Picus (2012). Picus observed that the variation in spending among districts had remained at a relatively constant level throughout the decade.

Woolf and Heaps (2012) also tracked the provision of core courses among high schools as a measure of opportunity to learn that might be related to student outcomes. The authors found a wide variation in the number of core courses offered when they looked at different sized high

schools, with the larger high schools offering a wider range of courses. Comparing the number of core courses to outcomes however did not result in the relationship they might have expected to student performance. They cited as evidence for this lack of relationship the fact that there was essentially no difference between large and small high schools in performance measures such as test scores. It might seem logical to expect the relationship to emerge that would appear to relate performance to the number of core courses. However, the metric they used was the proportion of students who achieved mastery on state tests, which were not scaled to assess growth over time and actually scaled by teachers to represent relative mastery within each year. So, it is not surprising that the comparison failed to achieve the expected relationship. While the question of the relationship between opportunities to learn and student performance was a great question, the measure of the performance chosen by Woolf and Heaps could probably not provide the answer they were seeking.

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#### OUTCOMES-BASED (PERFORMANCE-BASED FUNDING).

The relative failure of legislative initiatives such as the Elementary and Secondary Education Act to achieve the equality of educational opportunity or relative equity in outcomes for children with poverty backgrounds has led to a greater focus on the outcomes of schooling. Performance-based funding seems to conform to models of resource allocation that are more common in private business and industry. Some of the private education and charter school designs employ elements of performance-based budgeting when they lay claim to outcomes such as higher standardized test scores such as the SAT or ACT, or the high likelihood of admission to a preferred college or university or job placement in a desirable occupation. One common effect of the need to be responsive to performance outcomes is the behavior of institutions to increase the outcomes for the greatest reward at the lowest relative cost of earning the reward (Sexton, Comunale and Gara, 2012).<sup>52</sup> This sometimes leads private schools to become more selective in their admissions criteria. Other potential problematic side-effects include grade inflation to increase graduation outcomes, larger class sizes in order to maximize the cost-benefit ratio, and tracking or ‘leveling’ of outcomes so that standards are in effect weakened for some students.

Currently there are no K-12 public education funding systems that provide for outcomes or performance-based funding, although some of the charter school models approach an accountability model based on performance. In Ohio, at the level of higher education, there are funding mechanisms that base funding on course completions, degree attainment, research funding and other institution-specific measureable goals.<sup>53</sup>

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#### EFFICIENCY-BASED FUNDING

A third model of funding, identified by Sexton, et al, above, is “efficiency-based” funding. This model attempts to combine the base funding of the enrollment driven models, with the accountability advantage of the outcomes-based models and adds a measure of efficiency in

order to establish both a reward incentive and an adjustment for “site characteristics” such as student ability levels and other costs that are driven by location and student characteristics (p. 339). The result of the model is a series of equations that produce an index of efficiency that in turn leads to a reimbursement of performance costs. The models as presented by Sexton, et al, are experimental and designed primarily for public higher education systems. The authors do note, however, that the design for calculating performance costs and reimbursement has been in use since 1994 in public school transportation systems in North Carolina.

The implications for the above discussion on funding approaches include at least one definition of the relationship between funding and opportunities to learn and outcomes. If the model depicted in Figure 1 is to provide a framework for developing a planned change in the way in which public resources are acquired, allocated, used and evaluated, then the definition of each of the elements in the model will require careful and complete operational terms that are valid and reliable measures of each element. The nature of the relationships will further need to be specified as to the assumptions being made about the interaction of each element in this complex system we are calling “education.”

#### REPORTING FUNDING AND SPENDING.

There are several sources of information that describe the activity and the patterns of funding and spending in Vermont. The Vermont Department of Education website provides several sources of data that describe funding and spending, including one source which describes the “cost effectiveness” district comparison data,<sup>54</sup> The Vermont Department of Taxation,<sup>55</sup> is the other major source of education funding data. Funding and spending data collection and reporting is defined by the federal standard, Common Core of Data.<sup>56</sup>

One particular issue concerning the collection and reporting of financial data is the extent to which the data can be assigned to the level of particular schools, classrooms and ultimately students. While the data elements required for federal reporting are standardized, the levels at which the data are reported are not standardized. This means that some spending data can be assigned to particular schools and ultimately classrooms (e.g. staff salaries) other elements such as expenditures for curriculum are reported at a district level and hence not available for assignment to specific schools or classroom. This issue is discussed in more detail, below (see Analysis of the relationships among the Elements). Part of the reason that this has evolved is that the consolidation of schools and districts over time has resulted in economies of scale for expenditures but the assignment of costs has not continued at the lower levels of the organization. One possible solution to this problem is the imposition of a common chart of accounts at the level of the school. As required by Act 153 of 2009, Section 19, the Department of Education is currently developing a common chart of accounts that will adapt the methodology of the National Center for Education Statistics<sup>57</sup> to meet the needs of State granting agencies and of local educational agencies.<sup>58</sup>

Recommended funding metrics that would be most applicable to educational opportunities, reported on a per-pupil basis, includes the following:

- Educational Technology
- Arts and Music
- Physical Education
- Plant Operations
- Non-reimbursable Special Education costs
- Administrative costs
- Direct instruction costs
- Cost of core curriculum
- Supervisory Union administration
- Transportation
- Extracurricular activities – Athletic
- Extracurricular activities – Other

## OUTCOMES

The discussion of outcomes ordinarily begins (and sometimes ends) with the tests of knowledge and skill that schools and students are measured with in order to provide an estimate of what and how much has been learned over a given time period. Standardized tests, however, have been severely criticized as being insufficient measures and too narrowly designed to fully represent either the full range of student achievement or the breadth and depth of opportunities to learn provided by schools. (See testimony before the Working Group by Superintendent Brent Kay, August 15, 2012.)<sup>59</sup> Standardized tests have been selected by policy makers as measures of outcomes because they are relatively easy to obtain, have historically been used for the purpose of accountability, and can be administered to almost all students. It's the latter point that forms the basis for the measurement of equity.

In order to be able to judge the relative equity of outcomes for all students, all students need to be measured with a common, or at least comparable, instrument or measure. So when all students take a common assessment (the NECAP was actually named the New England Common Assessment) and then the scores of those groups who have been historically under-performing are presented side by side with other groups, policy makers can see to what extent attempts to enhance performance for those groups has worked. A basic assumption underlying this approach to accountability is that schools have the opportunity, the commitment to provide compensatory education and the opportunities to learn that are needed to overcome historic deficits in performance.

Other outcome measures that are both generally universally available and collected by schools include:

- Cohort graduation rates. These are the measures of the proportion of students from each major group who graduate with their peers on a timeline that is generally expected. So, for example, schools determine the extent to which students enter high school with their class and graduate four years later (when mobility is accounted for).
- College or post-school graduation enrollment in the next highest level of educational opportunity.
- Successful completion of the next highest level of educational opportunity.
- Post-school enrollment in education without remedial enrollment in basic curricular areas such as reading, writing, science or mathematics.
- Performance on a common end-of-course (or curriculum) assessment given by the school to represent the full range of expectations for all students in that school system. (Like a graduation test but usually to include work samples, portfolio assessment).

Other assessments are typically done on outcomes of learning at the local level. Many of these assessments, like performance assessments on specific tasks or internship evaluations done by faculty or peers are important sources of achievement data. However, for the purposes of assessing equity with outcome measures many of these assessments will not be given to all students and will thus not be useful to assess the equity of outcomes by groups. Individualized and personalized curriculum and assessment should be a choice for all students, and the public should know the extent to which all students choose the options.

Other outcome assessments that are often cited by citizen groups and the private sector include:

- Student (job applicant) ability to perform basic calculation and communication tasks required for job entry.
- Student (job applicant) ability to work in groups and be a productive and supportive team member.
- Student (job applicant) ability to solve problems with a variety of problem solving skills.

These assessments are generally not part of the school assessment portfolio for all students. There has been some assessment development of these student exit qualities by technical education centers and technical skill assessment developers but again, these are generally not made available for all students.

## RELIABILITY AND VALIDITY.

No discussion of assessment would be complete without a brief description of the two characteristics of assessment, which determine their worth. Assessments must be reliable measures of the trait or quality or ability to perform for all students who are assessed. That is, if an assessment is given at a point in time and the results collected for analysis, the repeat administration of that assessment should yield the same result (when effects for learning are controlled) the second time it is given. Assessments should provide consistent results. Assessments must also be valid measures of what the public wants to know. So, for example, if

students graduate from high school and the diploma that they have earned qualifies them to perform certain tasks, have certain knowledge as specified in the opportunities they have had to learn, then they all (who graduate) should be able to demonstrate those lessons learned after graduation. If they cannot, then the high school diploma is not a valid measure of the skill and knowledge expected.

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#### A BASIC ASSUMPTION ABOUT OUTCOMES:

If the investment of public funds is to be linked to the outcomes of the educational system, then the assessment of those outcomes must be both valid and reliable and represent the measurement of the outcomes across all students who receive public support.

### SPECIAL EDUCATION AND HUMAN SERVICES: INTERAGENCY COLLABORATION

The James M. Jeffords Center recently completed a study of opportunities for integrating service delivery for children with disabilities in Vermont, focusing on the Agency of Human Services and the Department of Education.<sup>60</sup> To inform this study, we conducted a review of previous legislative and organizational attempts to improve services, as well as a review of the literature related to the delivery of services to children and families and current efforts to bring about collaboration among agencies. Data describing current levels of funding and spending were reviewed and mapped across the state in an effort to identify locations that experienced high demand. Three focus groups were held in locations that experienced high demand on education and human services resources in order to probe questions concerning effectiveness and efficiency.

The findings detailed in the following report suggest that although Vermont has made considerable progress in the coordination of services and collaboration over the past twenty years, services are still administered by disparate and disconnected systems that are less effective in serving families than they should be. Although these findings were focused primarily on children served in the context of special education, we believe they represent services and outcomes that affect all children, constituting a critical component of educational opportunities in Vermont. For example, we found substantial variation of human service expenditures (school based health service claims), particularly in the amounts paid as tuition vs. direct instruction. The decision to provide direct services versus paying tuition for an out-of-district placement has important implications for educational opportunity, but decisions appear to be made primarily on the basis of cost. Major conclusions of the study include:

- Families continue to experience multiple partners in their midst who work hard at coordination but have difficulty communicating and providing services in concert rather than piecemeal. An integrated family oriented model should be structured to be integrated at the state, community and family levels.

- Service providers experience frustration with the “silo” problem. That is, when attempting to serve children or families they encounter needs that they cannot serve because their funding source is not categorized in such a way as to support a solution to a particular need.
- The spending data from both agencies show that there are children and families who are clients of both AHS and DOE. Both agencies recognize the need to collaborate in the attempts to deliver services through human service agency teams as well as schools.
- The experiences reported among both school and agency professionals have a common theme that identifies gaps in service eligibility and thus in services provided.

## DATA SYSTEMS AND DATA COLLECTION

Data systems for the collection of both opportunities to learn and the outcomes of schooling have always been a component of the educational systems in school districts, state and the nation. From the days of the one room school house in colonial times when teachers and principals wrote down curriculum in plan books and student performance in grade books, to the present systems of data processing that gather data in real-time from student performance on computers and cell phones, both types of data (opportunities and outcomes) have been collected and reported. With several levels of data systems operating simultaneously teachers’ laptops, have the potential to share data with school and district data systems that can, in turn, share data with state level data systems that can combine financial, health, criminal justice and educational data. These data can all be collected at the individual or person level and then aggregated to any level of combination afforded by the linkage of data at the person level. It is also possible to estimate the probability of linkage among data elements and produce data analysis that simulates the direct linkage of individual characteristics such as income, education, health status and practically any other data element that can be identified as belonging to an individual.

The collection and linkage of data elements such as opportunities to learn with outcome measures at the level of each student with a unique student identifier can enable state and school officials to study the relationships among opportunities to learn and outcomes. Further, linking funding and spending measures to opportunities to learn and outcomes can enable the question of to what extent investment at varying levels in varying opportunities to learn are related to the range of outcomes that students experience during and post the formal education that represents the investment.

The passage and implementation of No Child Left Behind with its outcome driven accountability system has accelerated the development of national, state and local data systems in order to provide the basis for the allocation of rewards and sanctions specified in the law. Chief among the initiatives at the federal level is the Institute of Educational Sciences (IES) Statewide



Longitudinal Data System (SLDS) grant program. This program is designed to provide federal funding to states to develop and construct the kind of comprehensive data system that can combine student level data from schools and districts with state level data to produce the EdFacts and Common Core of Data reporting to the federal government.

## RETURN ON INVESTMENT (ROI): ANALYSIS OF THE RELATIONSHIPS AMONG THE ELEMENTS RELATED TO RESOURCE ALLOCATION

The search for answers to the questions concerning the relationships among spending, opportunity to learn and outcomes as return on investment in education systems has recently been the subject of review and research (Boser, 2011).<sup>61</sup> The Center for American Progress (CAP) in its report Return on Educational Investment (available on the Working Group's website) has both defined ROI and discussed the state of the art in achieving a reliable model upon which to base policy decisions. First the definition:

*"In the business world, productivity is a measure of benefit received relative to spending. This project adopts that concept to measure public school districts' academic achievement relative to their educational spending, while controlling for cost of living, student poverty, the percentage of students in special education, and the percentage of English-language learners." (p. 46)*

Within a relatively specific definition of ROI for education the CAP report identifies several specific issues with the analysis among the input and output elements. (p 24)

1. The relationships between money spent and outcomes is not always linear across time,
2. There are no external benchmarks with which to compare districts or schools performances,
3. Variables outside of the control of the school or district often are not identified. The best of the regression models were able to account for about 23% of the total variation between the prediction and the actual performance.
4. Data upon which the ROI models were based were flawed by poor collection and measurement.

## PERFORMANCE EVALUATION

The search for answers to questions of accountability that are related to system performance in government has a particular history in Vermont dating from the attempts to measure community indicators of well-being according to a framework developed by Mark Friedman, known as Results-Based Accountability™.<sup>62</sup> The process of evaluation and planning was initiated with a partnership between then Commissioner of Education, Richard Mills and then Secretary of Human Services, Cornelius Hogan. Friedman proposes seven steps in a process to determine

quality and initiate change from any given system that provides services such as education and human services:

1. Who are our customers?

In Friedman's framework the answer to the first question, who are our customers is pivotal. In public education we might assume that answer to be all students. One indication that the answer is not all students is the extent to which students from various groups such as low income, ethnically diverse, special needs and even gender are routinely excluded from certain opportunities to learn. It is not unusual, for example, to find that among students who are enrolled in geometry, calculus, physics or chemistry there are proportionately few members of one group relative to another. It should be no surprise then, that when we measure the outcomes for all students there will be predictably fewer successes why nearly every outcome of schooling that is of interest to parents and to the society. There are at least two reasons why our customers must be all students: One, it's the law. Two, systematically excluding some students results in the progressive narrowing of the talent pool to the point where the society has less and less human potential developed for growth and adaptation. It's a progress-limiting, self-fulfilling prophecy.

2. How can we measure if our customers are better off? (Results and Outcomes)

The second question, how can we measure....can be answered by selecting the outcomes upon which the judgment about success can be made. Friedman's advice about this is to select only a few most important measures of outcomes that represent the highest value to the long term interest of all stakeholders. This in itself is a complicated task and involves a democratic process that is designed to achieve consensus.

3. How can we measure if we're delivering services well?

The third question, delivery of service is, in terms of the ROI evaluation for schools, the description and evaluation of both the equity of the delivery of opportunities to learn and the quality of the opportunities to learn delivered to all students.

4. How are we doing on the most important of these measures?

The fourth question, involves another, democratically designed process for deciding which, among all of the measures of success of the system we have chosen to measure, is the most important and the ones that we will finally use to guide the steps stakeholders may take to improve the system.

5. Who are the partners who have a potential role to play in doing better?

The fifth question, concerning who the partners are who need to be part of the solution to problems of system performance, is probably one of the most important questions to answer.

Define the partners too narrowly and the resources to bring to bear and commitment to the change is less likely. Define the group too broadly and we will find that everybody's problem is nobody's problem. In the case of the education system including stakeholders as narrowly defined as the customers who are students and broadly defined as the community including parents, community member who are not parents, legislators, teachers and administrators, business and industry, health professionals will be an important. Friedman's advice is to err on the side of inclusion.

6. What works to do better, including no-cost and low-cost ideas?

The sixth question, concerning what works better is a broad question that can be addressed in the context of spending and funding and in the provision of opportunities to learn. The analysis which asks, on the one hand, can the opportunity to learn be provided at less cost; and, on the other hand what works better in order to achieve the desired outcome is an exercise in balancing the costs with the benefits of such spending as the salaries of teachers, curricular materials, technology, etc. that makes the educational system both effective at reaching its goals and efficient at getting the optimum result with limited resources.

7. What do we propose to actually do?

The seventh and final question concerning how to improve the system leads to the step in Friedman's model, committing to action. What is it that will improve the system and enable a summary judgment at any point in time that the investment was justified?

These seven deceptively simple questions provide a framework that stakeholders at all levels of the educational system can use in order to inform what resources should be applied (funding and spending), how much resource should be applied and what outcomes we can all expect when a given period of time has passed.

## COMPLEXITY THEORY: AN ALTERNATIVE VIEW OF ANALYTICAL MODELS

Stakeholders in the education systems have questioned the analytical models and procedures used by researchers and evaluators to answer questions concerning the relationships among inputs and outcomes of systems. The limitations of evaluation processes that are grounded in standard econometric, educational research and social science research methods described in the preceding sections of this paper related to return on investment are many and complex. For the most part, the approaches employed historically and currently are governed by what are termed "linear" relationship assumptions. That is, the mathematical models used in most contemporary analyses assume that relationships develop in predictable ways, in real time and, for the most part, can be used to describe cause and effect relationships that are comprehensible. Relatively recently however (Waldrop, 1992)<sup>63</sup> a new science of systems analysis with applications in many fields including biology, economics, meteorology and physics that describes systems that are balanced "precariously between a state of stasis and entropy," and develop in seemingly

unpredictable ways (Johnson, 2008).<sup>64</sup> These emerging models question some of the assumptions that are made with standard econometric techniques.

However, the promise of complexity theory as a method for understanding the complex relationships among the variables such as funding and spending, opportunities to learn and outcomes is, as yet unproven. From a structural point of view however, clarifying the relationships among the various levels of the educational system, its boundaries, agents, and patterns of change might be extraordinarily useful in arriving at short term prediction of levels of outcomes that emerge when resources are applied. Professor Kieran Killeen, in a paper developed for the Working Group (2012)<sup>65</sup> has identified researchers who have had experience with Vermont data and have experimented with some of the techniques relevant to complexity theory. See: Baker and Richards (1999)<sup>66</sup> and Downes (2004).<sup>67</sup> One particular challenge to this approach in Vermont is the relatively narrow scope and depth of the Vermont data base for conducting analyses such as neural network types of studies.

Dr. Killeen, (2012) has provided three questions for discussion which may be helpful in resolving the methodological issues:

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#### DISCUSSION QUESTIONS

1. Does the analytical approach to evaluating and understanding Vermont's education system matter?
2. From the perspective of a Legislator, is there a downside to using certain types of analysis to understand Vermont's education system?
3. What are some possible uses of randomized experiments to study Vermont's education system? How have randomized experiments been used in other sectors of Vermont, and can they be applied to the study of education?

### RECOMMENDATIONS TO THE VERMONT LEGISLATURE AND GOVERNOR

#### SPECIFIC RECOMMENDATIONS

As indicated earlier, the summary recommendation is for greater integration of state and local policy and practice in such a way as to gain the maximum effect for the limited resource investment in the well-being of children, youth and families. For continuity primary recommendations from the executive summary have been included below.

The specific focus on the system of education has produced recommendations that follow from the review of Working Group documents, testimony and study of the literature on opportunity to learn and school performance. A basic principle guiding the recommendations below is that of both vertical (among the levels) and horizontal (among the partners) integration of information and decision making. Detailed recommendations on the integration of the larger systems of

Health, Human Services and Education are beyond the scope of this report. However, collaboration among the executive and legislative branches of Vermont government should result in:

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#### INTEGRATION OF SERVICES

- Were the recommendations already developed by the Vermont State Board and Department of Education to be implemented, it is likely that the schools would improve and students would achieve better outcomes. *However, without the integration of health, human services and education in such a way as to make the best use of limited resources of the state and its communities the potential impact of on-going attempts to improve services and outcomes will fall short.* The first step towards meeting this goal would be the development of an information system that provides transparency about the investments made by the State of Vermont, and the outcomes that result from those investments. In the last decade, the Agency of Human Services and Department of Education developed and published the Community Indicators of well-being that provided a starting point upon which to build an information system that would provide transparency of investment and outcomes so that all Vermonters could see how the state's resources were distributed on their behalf and what outcomes were resulting from investment.

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#### OPPORTUNITIES TO LEARN FROM BIRTH TO CAREER

- Pre-Kindergarten opportunities to learn should be available to all children from birth to kindergarten. These opportunities must be of equal quality as ensured by state licensure and review. The data systems currently being designed for monitoring these opportunities should include data on the resource allocations, implementation, and outcomes for pre-K programs. Integration with the Building Bright Futures Early Childhood Data Reporting system could provide a cost efficient means for disseminating early childhood data.
- Vermont should restore a student level assessment of opportunities to learn similar to the data collection made as part of the state assessment in 2004. Data from such a survey, completed by students as part of required assessments, would consume less than thirty minutes of instructional time and be automatically entered into a data stream that described opportunities to learn that can be mapped by school and disaggregated by gender, family background and disability status.
- Post-secondary opportunities should be available for all Vermont high school graduates without regard to income.
- Representatives of teacher preparation institutions and the Department of Education meeting to develop more rigorous and uniform teacher induction and preparation programs. These

groups should also participate with other stakeholder groups such as the Vermont NEA, VSBA, VPA and VSA in the design of teacher quality reporting systems that enable the mapping of teacher quality across the state, district by district, and school by school.

- A change in the culture of the relationships among teachers (as professionals) parents and policy makers to broaden the relationships such that teachers are respected and competitively compensated for their services and work as partners with parents. Salary levels for teachers should be mapped across the state to correspond with other opportunities to learn. The need to equalize services as a consideration for increasing opportunities to learn for all children in the state suggests revisiting the issue of the statewide teacher contract.

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#### A COMPREHENSIVE DATA AND QUALITY INDICATOR SYSTEM

- A comprehensive Quality Indicator System is needed to provide transparency of public investments, the results of those investments (opportunities for citizen development) and the outcomes in measureable terms that are associated with investments of public as well as private funds for support of children and families from birth to career across the health, education and human services systems. As noted previously, quality standards are currently under review by the Vermont Educational Quality Standards Commission.
- A comprehensive longitudinal data system must be established to evaluate student, teacher, and program outcomes that reflect the goals and investments of the strategic improvement plan. Data collected should be connected to strategic goals. The data system must measure and support the opportunity cost of data collection tasks at the local level. The recently funded VADR system (currently being implemented) may be capable of tracking some of these elements, mostly with respect to curriculum. The VADR is not a specific data collection system but, rather a plan to automate data collections from the supervisory unions to the Department for secondary reporting to the Federal Government. When the VADR is fully implemented the state will still need a comprehensive vertically and horizontally integrated information system that provides the linkage between investment, resource allocation and outcomes that the state needs to inform policy and systems change. The most important criteria for the design of the statewide data system is that it must be vertically and horizontally integrated across all of the state's systems that provide information on the inputs and outcomes of human services, health and education. This effort should be coordinated at the highest level of state government and be supported with appropriate funding, legislation and executive orders. This is a major undertaking and a long term goal, but the measurement of value added by investment will not be possible without such a system.
- Reports from the data systems, both local and state level, must be made available in a timely way to accommodate local decision making. The data system should be designed to follow

funding streams to defined programs to determine whether *funding specific strategies results in better student outcomes*. For example, the implementation of a new mathematics program supported by personalized learning plans could be assigned costs of implementation and students who participated in this program could be compared with other students who had not participated in personalized learning to determine the relative cost benefit.

- The definition of a comprehensive, longitudinal data system must include measures of funding and spending, opportunities to learn and outcomes as described in the Full Report. The reporting on school based data on these elements and their relationships must be integrated with other measures of community support, opportunities for community development and citizen outcomes similar to the Community Indicators published by the Vermont Agency of Human Services and Department of Education a decade ago. Indicators should also include services and outcomes of the justice system as well as health, human services and education.
- Perhaps most importantly, sufficient resources must be available at the local level for the collection and input of data. Data collection costs are a burden to school districts, and effective assistance is needed in order to ensure complete and accurate reporting.

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#### STATE PLAN FOR EDUCATIONAL IMPROVEMENT, EQUAL OPPORTUNITY, AND RESOURCE ALLOCATION

- Implementation of the comprehensive state plan to address education improvement and equal opportunity needs to be reported in a more timely fashion. That reporting needs to specify operational goals, timelines, performance management, and the resources needed. The plan should be updated to more specifically address the role of data collection at the local and state levels and the timeliness of data to coincide with local decision making schedules and scope (see below); it should also provide for regular reporting of progress and reassessment of objectives as new data emerge.
- A comprehensive state plan should emerge from the context of resolution of the issues related to school district reorganization and consolidation. Several attempts have been made in recent years to resolve the dilemmas associated with the scope of district programs, district leadership and boundaries. While Vermont students continue to move from one district to another the distribution of opportunities to learn and education quality can best be addressed from properly resourced and stable school districts.
- The state P-16 council should determine where educational improvement and equity stand among other state initiatives and to define the funding sources and capacity to address these challenges and implement improvement in a timely manner. This includes the capacity of the Department of Education to manage the improvement process.

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## APPENDIX: ADDITIONAL STATISTICAL TABLES AND DISCUSSION

### OTL MEASUREMENT AND RELIABILITY

The survey included 24 questions for high school students, and 23 questions for middle and elementary school students. Each question was presented in the form of a statement, for example, “I am often asked to judge the quality of my school-work”. Response options included “Not at all”, “A little bit”, “More than a little”, and “A lot”. These items were each coded numerically to form a 4-point ordinal scale. The feasibility of combining all items into a single scale was assessed by calculating Cronbach’s Alpha reliability coefficients for each grade level. In all cases reliability was high, ranging from  $\alpha = .86$  among 4<sup>th</sup> graders, to  $\alpha = .91$  among 10<sup>th</sup> graders. A scale of the OTL construct was created by averaging all items from the questionnaire if at least 80% of the questions had been answered. Scale scores and selected demographic variables were aggregated by supervisory union and provided to the Jeffords Center for analysis.

#### OTL RELIABILITY (MEAN OF ALL ITEMS)

	N	Alpha
Grade 4	4414	.86
Grade 8	6771	.90
Grade 10	6505	.91

### OTL AND ACADEMIC PERFORMANCE

To assess the relationship between OTL and academic performance, we used multiple regression analysis to control for factors such as gender (coded as percent male), ethnicity (coded as percent nonwhite), poverty (coded as percent free / reduced lunch eligible), and total per-pupil spending (same for all grades). Descriptive statistics for each variable are shown in the following table.

Because the OTL scale is composed of a large number of questions, the mean responses within supervisory unions fall into a narrow range. For example, in grade 8 the standard deviation is only 0.13. About 68% of supervisory unions will fall within the range of a single standard deviation, 2.92 – 3.18; and about 95% will fall within two standard deviations, 2.79 - 3.31. This means that scale differences that appear to be small may actually reflect important differences between supervisory unions.

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DESCRIPTIVE STATISTICS FOR VARIABLES IN REGRESSION MODEL

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	Grade 4 (n = 60)	Grade 8 (n = 60)	Grade 10 (n = 58)
<i>OTL Scale mean</i>			
Mean	3.42	3.05	2.98
SD	0.15	0.13	0.15
<i>% Met math standard</i>			
Mean	52.52	43.46	40.98
SD	14.06	12.99	10.56
<i>% Male</i>			
Mean	50.38	51.31	50.96
SD	5.97	5.29	5.76
<i>% Nonwhite</i>			
Mean	3.64	3.69	4.18
SD	3.51	3.19	3.80
<i>% Free / reduced lunch</i>			
Mean	28.44	23.84	16.60
SD	12.91	11.00	10.20
<i>Per Pupil Spending (all grades)</i>			
Mean	11,330	11,330	11,340
SD	1,279	1,279	1,298

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*For percent nonwhite, n = 59 in grade 8; n = 54 in grade 10.*

Multiple regression analysis allows us to identify the influence of several factors at the same time on mathematics performance outcomes. In this case, we look at the relationship between student-reported OTL and the percent of students meeting the overall mathematics standard, after taking into account (“controlling for”) the distributions of gender, ethnicity, free / reduced lunch status, and per-pupil spending. A positive relationship does not prove that learning opportunities directly influence academic performance, but it does mean that some kind of relationship is likely.

The results of the regression analysis are shown below, separately for each grade level. Statistically significant predictors (indicating a relationship that is unlikely to have occurred by chance) are marked with asterisks indicating the associated probability level. The standardized regression coefficients indicate the amount of model-predicted change in the percent of students meeting overall math standard, in standard deviation units so that coefficients can be compared on a common metric.

For each grade level the models accounted for a substantial proportion of variability in percent of students meeting the math standard (this proportion is shown on the “Model R square” line). Even in the absence of data representing the mathematics curriculum implemented at schools and experienced by students, more than half of the variation among 8<sup>th</sup> graders (56%) is accounted for by OTL, gender, ethnicity, poverty status, and per-pupil spending. The impact of poverty as measured by free / reduced lunch eligibility is most evident among grades 4 and 8, and independent effects for per-pupil spending were only evident among students in the 8<sup>th</sup> grade.

*The potential impact of OTL on mathematics achievement is substantial.* For every 1-point increase in mean ratings on the 4-point OTL scale, the expected percentage point increase in a supervisory union’s students meeting the math standard is 44 in grade 4, 38 in grade 8, and 26 in grade 10.

STANDARDIZED REGRESSION COEFFICIENTS ON PERCENT MEETING OVERALL MATHEMATICS STANDARD

	Grade 4 (n = 60)	Grade 8 (n = 59)	Grade 10 (n = 54)
OTL (mean)	.47***	.38***	.35*
% Male (mean)	-.16	.01	.03
% Non-white (mean)	.05	-.07	-.00
% Free / Reduced Lunch (mean)	-.44***	-.58***	-.26
Per Pupil Spending (mean)	.19	.25**	-.42
Model R square	.42	.56	.27

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

ARE OPPORTUNITIES TO LEARN EQUITABLY DISTRIBUTED?

To evaluate the extent to which OTL varies by supervisory unions, and the implications of any variability, we compared results for the high and low rated 10<sup>th</sup> percentiles by dividing the mean for the 90<sup>th</sup> percentile group by the 10<sup>th</sup> percentile mean (shown below following the maps). This *decile dispersion ratio* simply shows the extent to which supervisory unions rated highest in OTL differ from those rated lowest. For example, the 5 supervisory unions in the 90<sup>th</sup> percentile OTL ratings had OTL scores that were 1.2 times higher than those in the 10<sup>th</sup> percentile. Although these ratios may appear small, they are equivalent to a substantial proportion of the overall range in OTL (again, this is because the OTL scale is based on a large number of questions). The impact of OTL dispersion can be seen in the equivalent ratios for the percent of students meeting the overall mathematics standard. Across all grades, the *students in the highest rated 10<sup>th</sup> percentile of supervisory unions (for OTL) met the standard at 1.4 – 1.6 times the rate for the lowest rated 10%, with differences of about 20 percentage points for each grade. Per-*

pupil spending appeared to be more or less equally distributed across the highest and lowest supervisory unions for OTL, with dispersion ratios in the neighborhood of 1 for all grades.

DISPERSION RATIOS FOR OTL, MATHEMATICS PERFORMANCE, AND PER-PUPIL SPENDING

	<i>Mean OTL</i>	<i>% Met math standard (mean)</i>	<i>Per-pupil spending (mean)</i>	<i>Dispersion Ratio (Decile)</i>		
				<i>Mean OTL</i>	<i>% Met standard</i>	<i>Per-pupil spending</i>
<i>Grade 4 OTL</i>						
90 <sup>th</sup> Pctl (n = 6)	3.66	55.31	11,412	1.17	1.43	1.03
10 <sup>th</sup> Pctl (n = 6)	3.12	38.60	11,046			
<i>Grade 8 OTL</i>						
90 <sup>th</sup> Pctl (n = 6)	3.24	54.52	10,787	1.15	1.63	0.91
10 <sup>th</sup> Pctl (n = 6)	2.82	33.41	11,797			
<i>Grade 10 OTL</i>						
90 <sup>th</sup> Pctl (n = 5)	3.25	48.92	10,755	1.20	1.65	0.93
10 <sup>th</sup> Pctl (n = 5)	2.70	29.40	11,615			

The dispersion ratios of < 1 for per pupil spending in grades 8 and 10 imply *that some of the highest rated supervisory unions for OTL may actually be spending less money than the lowest rated ones*. The following table lists the supervisory unions in the high and low 10 percentiles, along with their 2004 per-pupil spending (2004 spending selected for comparability with the OTL survey data). In grades 8 and 10, there are low-spending SUs in the top OTL decile. In grade 8 this is Chittenden East (\$9,433), and in grade 10 this is Franklin West (\$8,910). Similarly, there is at least one high spending SU among the lowest OTL ratings (Windham Northeast, again for grade 8).



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SUPERVISORY UNIONS IN 90<sup>TH</sup> AND 10<sup>TH</sup> PERCENTILES FOR OTL, WITH PER PUPIL SPENDING

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	<i>10 Percentile OTL (Lowest to Highest)</i>	<i>Per Pupil Spending (Mean)</i>	<i>90 Percentile OTL (Highest to Lowest)</i>	<i>Per Pupil Spending (Mean)</i>
<b>Grade 4</b>	Battenkill Valley	11,287	Orleans Central	11,609
	Essex North	11,152	Blue Mountain	11,254
	Orange North	10,600	Winooski	10,280
	Addison Northeast	10,700	Rutland Windsor	12,831
	Rutland South	10,434	Hartford	10,160
	Montpelier	12,100	Rutland Northeast	12,337
<b>Grade 8</b>	Washington South	10,473	South Burlington	10,546
	Windsor Southeast	10,768	Rutland South	10,434
	Washington Northeast	12,278	Bennington Rutland	12,696
	Rutland Windsor	12,831	Chittenden East	9,433
	Windham Northeast	14,668	Lamoille South	10,006
	Milton Town	9,766	Orleans Central	11,609
<b>Grade 10</b>	Windsor Southeast	10,768	Burr & Burton Acad.	12,696
	Franklin Northeast	10,371	St. Johnsbury Acad.	10,301
	Windham Northeast	14,668	Chittenden Central	11,707
	Orange North	10,600	Franklin West	8,910
	Orleans Southwest	11,670	Hartford	10,160

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## HOW ARE INDIVIDUAL OTL ITEMS DISTRIBUTED?

We selected three questions from the OTL scale to illustrate the degree of dispersion for a variety of scale components:

- My school-work is evaluated with written projects, oral reports, portfolios or performances.
- Teachers believe that all students can learn what teachers are teaching.
- I feel safe in this school.

Again, as for all of the OTL questions, response choices included “Not at all”, “A little bit”, “More than a little”, and “A lot”. The following table shows the mean and range for percentages of students selecting the maximum rating (“A lot”), aggregated within supervisory unions.

MEAN AND STANDARD DEVIATION FOR SINGLE-ITEM EXAMPLES (PERCENT SELECTING MAXIMUM RATING)

	<b>Grade 4</b> <i>(n = 60)</i>	<b>Grade 8</b> <i>(n = 60)</i>	<b>Grade 10</b> <i>(n = 58)</i>
<i>Schoolwork evaluated with projects</i>			
Mean % max rating	58.6	39.2	33.8
SD	11.3	9.3	11.2
<i>Teachers believe students can learn</i>			
Mean % max rating	69.6	46.9	42.9
SD	9.4	7.0	7.5
<i>I feel safe in this school</i>			
Mean % max rating	75.0	43.0	42.6
SD	7.4	10.1	12.2

As shown previously for OTL, mathematics performance and per-pupil spending, we calculated decile-based dispersion ratios for each of the single-item examples, based on the percentages of students selecting the maximum rating (“A lot”), aggregated within supervisory unions. These percentages differed considerably between the high and low 10% of supervisory unions on OTL. For example, *of the 10% of supervisory unions rated highest on OTL by 10<sup>th</sup> graders, the percentage of students selecting the highest rating (“A lot”) for the question “I feel safe in this school” was more than double that for supervisory unions rated in the bottom 10% for OTL.*

The maps on the following page show the mean percent of “A lot” ratings for two example items by supervisory union, again for 8<sup>th</sup> grade students. As in the previous example, supervisory unions are color-coded to provide a high-level view of variability, with low scores shown in red and high scores shown in green. One observation that can be made about these distributions of opportunities to learn is that there is considerable similarity in the patterns of students’ ratings. That is, certain areas of the state appear to have “better opportunities to learn” as measured by the level of expectations that students sense their teachers have of their potential. The patterns of these ratings are similar when related to safety and the frequency of the use of “inquiry” type of teaching methods.

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DISPERSION RATIOS FOR SINGLE-ITEM EXAMPLES

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	<i>Mean Percent Maximum Rating</i>			<i>Dispersion Ratio (Decile)</i>		
	<i>Project Work</i>	<i>Teachers Expect Learning</i>	<i>Feel Safe</i>	<i>Project Work</i>	<i>Teachers Expect Learning</i>	<i>Feel Safe</i>
<i>Grade 4</i>						
90 <sup>th</sup> Pctl (n = 6)	75.30	80.00	83.49			
10 <sup>th</sup> Pctl (n = 6)	41.29	62.40	62.73	1.82	1.28	1.33
<i>Grade 8</i>						
90 <sup>th</sup> Pctl (n = 6)	41.68	52.99	55.87			
10 <sup>th</sup> Pctl (n = 6)	28.92	39.40	30.48	1.44	1.34	1.83
<i>Grade 10</i>						
90 <sup>th</sup> Pctl (n = 5)	46.69	51.45	56.10			
10 <sup>th</sup> Pctl (n = 5)	25.62	34.48	23.97	1.82	1.49	2.34

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## COEFFICIENTS OF VARIATION

It is common practice in studies of equity to include the Coefficient of Variation (CV) as a primary indicator of equity (add ref to measuring equity). The CV is simply the standard deviation of a measure divided by the average (mean), and generally ranges between zero and one. Low numbers are taken to indicate an equitable distribution, while high numbers indicate inequity. For example, Odden and Picus<sup>2</sup> indicated that a CV of .10 shows the achievement of “substantial equity” for financial data.

When applied to OTL the CV is misleading because, as described above, the index is based on a large number of items. This results in a highly reliable measure with low variability, which downwardly biases the CV. For this reason the CV values of the individual items presents a more appropriate benchmark. As shown in the following table, the CV values for the OTL scale are only .04 - .05, but for the three example indicators shown above, they range from .10 to .33, with the highest numbers in the 10<sup>th</sup> grade. The high CV values for mathematics performance and poverty status further underscore the significance of inequalities on these dimensions for Vermont.

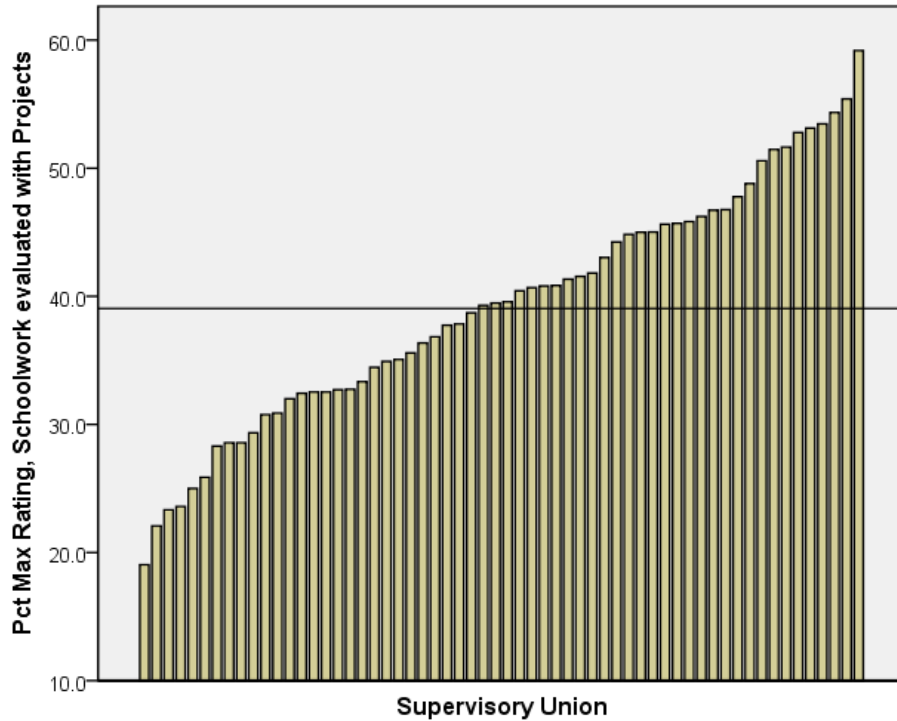
### COEFFICIENTS OF VARIATION FOR SELECTED VARIABLES

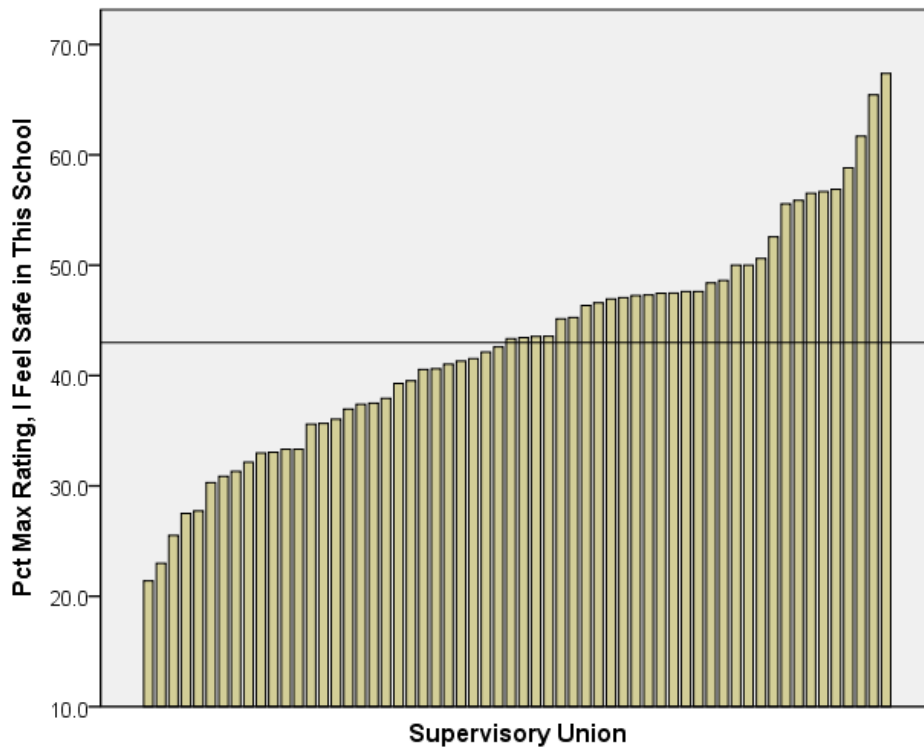
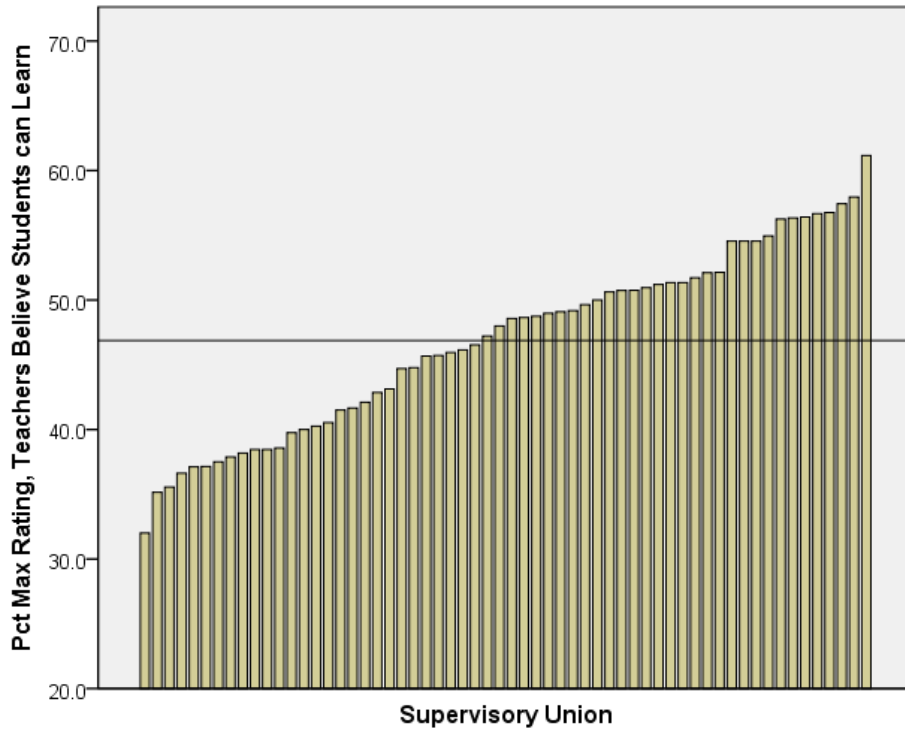
	Grade 4 (n = 60)	Grade 8 (n = 60)	Grade 10 (n = 58)
<i>% Met math standard</i>	.26	.30	.26
<i>% Free / reduced Lunch</i>	.45	.46	.61
<i>Mean OTL</i>	.04	.04	.05
<i>Schoolwork Evaluated with Projects</i>	.19	.24	.33
<i>Teachers believe students can Learn</i>	.14	.15	.17
<i>I feel safe in this school</i>	.10	.23	.29

The CV results above are further demonstrated by graphically illustrating the full range of values on selected measures for each Supervisory Union (shown for 8<sup>th</sup> grade only). The following bar charts show sorted values (lowest to highest) for OTL and the three component examples, with a

<sup>2</sup> Odden, A.R. & Picus, L.O. (2004). *School Finance: A Policy Perspective*, 3rd ed., Boston: McGraw Hill.

reference line indicating the mean value. For example, the first figure (percent indicating highest rating for “I feel safe in this school”) shows the dramatic spread of values from the lowest rated SUs (left) to the highest rated (right), and a pronounced curve at the high and low ends of the distribution. Similar results are shown for the other two example items (Schoolwork evaluated with projects and Teachers believe students can learn). The low CV for mean OTL does *not* mean that opportunities to learn are equitably distributed in Vermont.





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