MANAGEMENT ANALYSIS & PLANNING, INC

A REVIEW OF THE OREGON QUALITY EDUCATION MODEL

Submitted to the
Oregon Department of Education

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EXECUTIVE SUMMARY

This report was prepared at the request of the Oregon Quality Education Commission and provides a review of the Oregon Quality Education Model (OQEM). We compare the OQEM to similar models in other states and offer recommendations for refinement.

The OQEM is an education finance model designed to help the Oregon State Legislature determine an adequate amount of funding for the state's schools. The model originated in 1997, when the Oregon Legislative Council on Quality Education was charged with defining the fundamental requirements and costs of a quality education and creating a tool to help state policy makers determine what total education expenditures should be. The Council developed a model based on prototype schools that seeks to build a relationship between funding and student performance. In 1999 the Governor created the Quality Education Commission to further refine and validate the Oregon Quality Education Model (OQEM). Management Analysis and Planning, Inc. (MAP) was engaged by the Oregon Commission to assist in their review. This report presents our findings.

Overall, the OQEM appears to be a detailed, thorough model of adequate education resources. Our analysis finds that the nature and quantity of inputs in the OQEM is generally consistent with other models and the national literature. For the most part, the methodology used in determining costs also appears to be appropriate.

The level of detail in the OQEM is commendable. The model takes care to specify not only the main expenditure categories but also subcomponents for each. For instance, the OQEM considers the ratio of students per computer and how often computer hardware and software will need to be updated. In contrast, while the comparison models may have originally been developed through similarly detailed analyses, the final versions tend to provide lump sums for broad expenditure categories. The advantage of the detail in the OQEM is that as research and practice provide better information about how particular inputs affect student achievement, it is relatively easy to update the Oregon model accordingly. On the other hand, it is important to remember that the level of detail is not intended to be prescriptive, but merely to accurately estimate costs.

One reason why the OQEM could be specified in such detail is that model developers had a rich source of data available. Oregon was foresighted in developing a statewide data collection system, since without accurate cost data the validity of the adequacy model could be seriously compromised. Both Maine and Wyoming were hampered in their efforts to develop adequacy models by lack of reliable or available data. Oregon can expect the validity of the OQEM cost estimates to increase as the Database Initiative Project moves from the pilot stages into full implementation and more accurate data become available.

MAIN FINDINGS

Comparison to Other Models: The nature and quantity of inputs in the OQEM is generally consistent with those in other models and the national literature. Note that in instances where resource levels in the OQEM are lower than in other models, this does not necessarily imply that the levels are inadequate. While national figures are a useful tool for comparison, individual situations in each state may make different levels of resources appropriate for certain inputs.

Staffing Patterns: Overall the OQEM tends to provide fewer staff positions than the comparison models, and while it specifies comparable numbers of certificated staff it allocates fewer teachers to regular classroom positions. Thus class size in the OQEM tends to be higher than in the other models although pupil-teacher ratios are approximately the same. Assuming that these models all take a block-grant approach and allow schools to use the funds as they deem appropriate, differences in staffing patterns are relatively unimportant. One additional staffing area that the OQEM currently does not address but which policy makers may want to consider incorporating is substitute teachers. MAP understands that the Oregon Department of Education is presently estimating the costs of substitute teachers for schools of the prototype size, and that this will be included in the next iteration of the model.

Instructional Materials & Supplies, Equipment, and Technology: It is difficult to compare these costs across models since each state uses a different categorization system. The OQEM inputs appear to be somewhat lower than those in the comparison models, especially at the secondary level. In particular the technology resources seem less rich than in the counterpart models, though this may be due to the assumptions the OQEM makes about the level of technology already available in the prototype schools. As a consequence, it is particularly important that policy makers review the accuracy of these assumptions before setting technology funding levels in the model.

Other Expenditures: The OQEM funds professional development at a higher level than the comparison models, and also is unique in specifying funding for extended instruction. On the other hand, unlike Maine and Wyoming it does not provide funding for assessment or for programs for gifted students. Maintenance and operations costs also appear lower in the OQEM than in the comparison models.

Total Expenditures: Only two other states, Maine and Wyoming, have attempted to define the nature and costs of an adequate education using a prototype model approach. Although the particulars of the Maine, Wyoming, and OQEM models differ substantially, the final per-pupil expenditures are similar. This finding supports the validity of the funding levels generated by the OQEM. It is also an indication that schools can use the same levels of resources in different ways to achieve positive results, and that the state should be more concerned with providing an adequate level of funding and specifying desired outcomes than with prescribing specific operating inputs.

Cost Methodology: The methodology employed by the OQEM for determining non-personnel and classified staff costs (i.e., use of statewide averages) is consistent with current economic theory and appears appropriate. Estimating the costs of professional staff such as teachers and administrators by that same method may prove problematic. A more sophisticated market analysis of salaries and benefits for professional staff may be indicated.

Links to Student Achievement: The goal of the OQEM is to establish a system that provides sufficient resources to enable 90 percent Oregon's students to pass the state assessment. Attempting to link specified levels of funding with specified levels of achievement is a worthy goal, but current research suggests that making such links with precision is still not possible. Researchers are still working on ways to accurately measure the factors that influence student learning (such as teacher quality), and it is as yet impossible to control for all the complex, interacting factors that affect educational outcomes. Policy makers in Oregon should not expect the adequacy model to definitively link funding to achievement. They should also be prepared for the fact that it will take longer for some schools to reach this goal than for others.

Funding Formula Issues: The current funding formula in Oregon is based on a foundation amount per pupil, adjusted for various student and district characteristics by means of a student weighting mechanism. Lawmakers should be cautious about simply replacing the current foundation amount with the level of funding determined by the OQEM, since it is important to ensure that the weighting system is aligned with the assumptions in the OQEM. Otherwise, the funding formula may not target funds as intended. The legislature may also want to consider moving from a weighting system to a cost-based block grant approach, which will achieve approximately the same results but may prove more transparent and easier for the public to understand.

Governance: Adequacy models tend to place the state in greater control of school finance and organization. The OQEM provides a very specific set of inputs to the education process. There is a risk that some districts that choose different spending patterns may not meet the state standards. In fact, some that do design schools to look like the prototypes may not succeed either. As Oregon policy makers evaluate student outcomes, it is important to keep in mind that the OQEM is a funding model, not a prescriptive operational input model. If the state requires all districts not meeting state standards to implement the OQEM exactly as designed, local control will suffer and there is no guarantee student performance will improve. State prescription and district accountability are incompatible. Once a state prescribes programs it becomes accountable for the performance outcomes produced.

Intangible Factors: Intangibles are factors associated with improved student outcomes but not easily measurable or directly related to tangible costs. Absent substantially better data collection, it is not possible to measure these intangible elements, nor estimate what they might cost. It may never be possible to determine the true costs of some of these elements. As data systems improve, researchers may be able to gain a better understanding of the intangible costs of providing a quality education for all children, and the state may be able to include them in the OQEM as appropriate. However, the state should also be cognizant of the costs of such data collection efforts. Spending large sums of money and devoting considerable efforts on the part of

state and district staff to collect these data may not be an efficient or cost-effective way to improve student performance.

CONCLUSIONS

Oregon is one of a handful of states that is using or considering the professional judgment approach to funding an adequate educational program for its K-12 public school students. The OQEM represents an excellent effort to identify and cost the essential elements of an adequate education. The challenge facing the state today is implementing this model in a fair and efficient way that will lead to improved student outcomes.

Chapter 1. Introduction

State education policy makers are becoming increasingly interested in the collection and use of school-level data as they seek ways to hold schools accountable for student performance and the use of fiscal resources. The state of Oregon is at the forefront of these efforts. The purpose of this study is to report Management Analysis & Planning Inc.'s findings and recommendations for refinement of the Oregon Quality Education Model (OQEM). The OQEM, combined with Oregon's efforts to account for school spending through the Database Initiative Project (DBI), offers policy makers in Oregon the potential to establish a system whereby the relationship between school funding and student performance can be better understood. Such a system will help education officials in Oregon estimate the costs associated with providing the state's children with a high-quality education.

The OQEM is one of a new breed of school finance models designed generally to insure that a state provides all children with an adequate[1] education. The OQEM falls into the category of "professional judgment" models. Under this approach, the state defines the desired educational outcomes and then determines the type and quantity of inputs necessary for student in a prototypical school to reach this achievement level. Costs for each of the inputs are estimated and then summed into a final per-pupil expenditure level. The statewide education funding formula may then be based on this amount, adjusted for student and district characteristics as necessary. In essence, educators and policy makers set the education goals, and then determine the characteristics of the prototype schools necessary, in their judgment, to meet those goals.

MAP was asked to work with the OQEM Commission to review the current version of the OQEM, and make recommendations to the Commission about how the model might be improved to insure its accuracy in estimating how much money is needed by the state of Oregon to fund the educational needs of its K-12 public school population. MAP was also asked to compare the OQEM with similar efforts underway in other states. This report presents our findings to the Commission.

The OQEM, like other professional judgment models, is a funding model, not a prescriptive determination of how each school should be organized or allocate its resources. In other words, the prototype determines how much revenue is needed for each pupil in the state, but lets individual districts and schools ascertain how best to use those resources. Oregon policy makers have established the goal of 90 percent of students meeting state standards. The OQEM creates prototype schools that, in the judgment of qualified professionals, are able to achieve this goal. However, it is important that the Commission realize that while the model is designed to estimate the level of resources needed to produce the desired outcome, it cannot assure that in every case these outcomes will be achieved if the specified inputs are utilized. Producing educational outcomes is as much art as science, and therefore precludes guaranteeing that any level or combination of resources will inevitably produce predicted outcomes. Adequacy models are

[1] The OQEM Commission uses the term "quality," but for the purposes of this report we have chosen to use "adequate." Both terms are understood to refer to the educational opportunities defined by Oregon law and regulations.

based on the notion of an existence proof, i.e. that the outcomes *can* be produced with this level of resources, not that they necessarily will be.

We begin by providing a brief history of the OQEM, summarizing recent changes in Oregon's state constitution and state laws that have altered the way schools are funded across the state. As a result of the restrictions on local property taxation established by the voters, the state has become responsible for providing the majority of school revenues. Perhaps more importantly, the state, as the provider of the marginal dollar, determines how much money schools will have. The question facing the legislature is: How much money do the schools need to meet the state's goals? There are several methods for determining what constitutes an adequate level of funding, and we provide a brief summary of each of the different approaches.

Once we have set the stage by describing the historical context and the different types of adequacy models, the remaining chapters provide a detailed review of our findings regarding the OQEM. Chapter 2 briefly describes the models we have identified as useful comparisons for the OQEM. Chapter 3 offers a detailed comparison of the components of the OQEM with those of the comparison models, analyzing the content, derivation method, and cost of each component. Chapter 4 examines three important issues. The first part of the chapter considers the implementation of the OQEM, looking at issues involved in directing funds to individual schools and school districts. The second section of Chapter 4 looks at the issue of linking the model to student outcomes. As suggested above, MAP is concerned about the implied promise that full funding of OQEM will result in 90 percent of the students in Oregon meeting state standards. It is not that MAP feels this goal is impossible, but rather there are a number of factors affecting student achievement besides funding. Measuring and controlling these factors is not easy. In the third section of Chapter 4 we discuss in more depth the issue of these intangible factors and how they are likely to impact achievement of the state's student performance goals.

HISTORICAL CONTEXT

Prior to the 1990s, local Oregon school boards and voters significantly shaped school district budgets. Many school districts relied on district voters to approve operating levies each year to ensure adequate resources for schools. The state's role in funding schools was limited to approximately 30 percent of operating funds. As a result, there were substantial disparities in per-pupil spending among the districts in the state.[2] Several key pieces of legislation and policy changes since that time have dramatically altered the face of school funding in Oregon:

- Ballot Measures 5, 47, and 50
- The Oregon Education Act for the 21st Century (HB 3565 and HB 2991)
- School Funding Equalization
- The Database Initiative Project

[2] Disparities in per pupil spending are common in systems that rely substantially on local resources to fund schools. Districts with higher wealth per pupil are able to provide more money for schools, often with lower tax rates. For a discussion of these issues, see Odden and Picus (2000).

Ballot Measures 5, 47, and 50

In 1990, Oregon voters concerned with high property taxes passed Ballot Measure 5. This initiative limits the tax rate school districts can levy on local property for school operations to no more than $5 per $1,000 of assessed value over a period of five years. Capital and bonded debt levies were excluded from this limit. Ballot Measure 5 required the state to replace the local property tax loses. Consequently, control of school district funding decisions effectively shifted to the State Legislature.

The voters passed two additional tax initiatives. Measure 47, passed in 1996, placed further restrictions on local school district property tax collections and increased the state's responsibility for funding schools. Measure 50 made some changes to Measure 47 and was passed before Measure 47 took effect. Thus, Measure 50 and the limits established in Measure 5 control the system under which Oregon school district property taxes are collected today.

As a result of these three voter-approved initiatives, the state now funds approximately 70 percent of the costs of K-12 education. School funding is determined by the legislature and approved as part of the biennial budget process. School funding represents approximately half of the state's entire general fund budget.

The Oregon Education Act for the 21st Century (HB 3565 and HB 2991)

In 1991, Oregon became something of a pioneer in the development of standards for what students should know and be able to do. The Oregon Education Act for the 21st Century authorized the state to develop standards for student knowledge and skills. Rigorous academic content standards in math, science, history, geography, economics, civics, and English were established by the state. Beginning in 1998-99, students had to meet these standards to earn a Certificate of Initial Mastery (CIM) in the 10th grade. The act required that by 2004-05, 12th graders would have to earn a Certificate of Advanced Mastery (CAM) to graduate. Benchmarks for state testing in English, math, science and social studies were established for the 3rd, 5th, 8th, and 10th grades. The state tests are aligned with Oregon's content and performance standards.

School Funding Equalization

In addition to its new responsibility for funding education, and the new education standards that were being established, the legislature also took responsibility for equalizing funding among the state's school districts in 1991. Legislation was passed during the 1991 session of the legislature that gradually phased in more equalized revenues for school districts. The goal was to level the playing field between high- and low-spending districts and set the stage for comparisons of the results schools were achieving with similar resources.

The Database Initiative Project

The Oregon Database Initiative Project (DBI) was established by the legislature in 1997 to create common definitions of various spending functions. All districts are expected to begin coding and

reporting expenditures in a uniform manner beginning in December 1999 so that by January 2001 the state will be able to compare spending decisions at any school or district to all other schools and districts in the state.

THE OREGON QUALITY EDUCATION MODEL (OQEM)

The main purposes of the OQEM are to determine the components of a complete, high-quality education designed to meet Oregon's high academic standards, and to develop a model that can determine the costs of these components (Oregon Legislative Assembly, 1999). The OQEM is composed of three prototype schools, one for each school level (elementary, middle school, and high school). The prototypes are designed to encompass the full costs of providing students with an adequate education. The model groups all costs into broad organizing categories called elements (functions or activities important to schools) and subcategories called components. Elements often correspond with the typical budget categories contained in school budgets and are selected to reflect their importance to student learning.

The elements and components were assigned costs based on available data from several sources: the DBI, research on effective practices, the Oregon Department of Education (ODE), education professional organizations, and experts from Oregon's school districts and schools. Tangible characteristics (e.g., student-teacher ratio) and intangible characteristics (e.g., measures of parent involvement or principal effectiveness) were also identified. Assumptions were made about the prototype schools' socioeconomic status, geographic location, building age, and other factors that help establish the context within which the elements, components, and characteristics are assumed to interact.

Once the final prototype models have been determined and the DBI is fully operational, it should be possible to estimate the costs of a quality education with some precision. Adjustments can then be made for schools with characteristics that differ substantially from the prototypes.

In November 1999 Governor John Kitzhaber and State Superintendent Stan Bunn appointed a group of citizens to the Quality Education Commission. The Commission was charged with the following tasks:

- Identify key issues to address in further validating and refining the Quality Education Model;
- Solicit public input regarding educational priorities for use in developing the model;
- Make recommendations regarding model development based on research, data, public input and experience; and,
- Communicate with stakeholders regarding model development.

This report was prepared by MAP for the OQEM Commission.

TYPES OF ADEQUACY MODELS IN USE ACROSS THE UNITED STATES

The OQEM is one of a class of finance models knows as adequacy models. The purpose of these models is to help ascertain the amount of money needed to provide every child with an opportunity for a specified adequate education. Currently there are four general approaches used to estimate the costs of an adequate education. Each is described briefly below.

Professional Judgment Models

Developed by MAP for the state of Wyoming, this model is the most similar to the OQEM. Charged by the court with defining a "proper" education and funding it, the Wyoming Legislature established a basket of desired educational outcomes and created three prototype school models—one each for elementary, middle and high school—designed to meet those outcomes. The costs of these models were then estimated by MAP and the resulting figures were used to fund school districts through the state finance formula.

The Ohio Adequacy Model

Faced with a court ruling requiring that all children receive an adequate education, Ohio responded in a different manner. The state has in existence a set of school standards that all school districts are expected to meet. By identifying districts that meet state standards and assessing the costs incurred by each, it is possible to estimate the expected cost of providing an adequate education. While questions have been raised regarding which districts should be included in the analysis, and how to handle districts that meet all of the standards one year but not the next, this model also offers an approach for state policy makers to consider.

Cost Functions

Many economists have attempted to understand the relationship between spending and student achievement through the use of production functions.[3] In such research, student achievement is the dependent variable and one of the independent variables is spending per pupil or some proxy for spending. An alternative being considered by economists is to turn the equation around and make the expenditures the dependent variable and the level of desired student achievement one of the independent variables. This approach is very new and has been used in only a handful of states, notably Wisconsin and New York.

Resource Cost Models

The Resource Cost Model (RCM) uses groups of professional educator experts to first identify base staffing levels for the regular education program, and then identifies effective program practices and their staffing and resource needs for compensatory, special and bilingual education. All ingredients are assessed using average price figures, but in determining the foundation dollar amount for each district, the totals are adjusted by a geographic education price index. This

[3] See Appendix C for an expanded discussion of education production functions.

method was used to propose foundation spending levels for both Illinois and Alaska, but neither of the proposals were ever implemented.

Table 1-1 summarizes the types of models in use or under consideration in our sample of comparison states. The next chapter of this report offers a description of the approaches used in five other states that are also attempting to implement an adequacy funding model.

Table 1-1
Summary of State Adequacy Models in Place or Under Consideration

Model	Type	Base Funding Year
OQEM	Professional judgment prototype model	1998-99
Maine	Professional judgment prototype model	1997-98
Wyoming	Professional judgment prototype model	Funds the 1998-99 year, based on 1996-97 data
Illinois	Performance-based methodology (not implemented)	1997
Ohio	Proposed prototype model (in development); Modified Ohio/Augenblick adequacy method	Prototype model not costed out; Augenblick numbers inflated to 1999 dollars

Chapter 2. Comparison Model Descriptions

MAP was asked by the OQEM Commission to assess how the OQEM compares to similar education finance models in other states. Few other states have attempted to determine the core or full costs of an education. Lack of data, difficulties in defining essential programs and services, disputes over "adequate" resource levels, and practical problems in distinguishing between costs and expenditures make such an endeavor daunting. In addition to Oregon, only a handful of states are moving ahead with this task, prodded by courts or their state legislatures.

MAP has identified five states whose work on adequacy issues provides a useful comparison for the OQEM: Maine, Wyoming, Tennessee, Ohio, and Illinois. These states are each attempting to define what an adequate education is and how much it costs. Policy makers in Oregon will likely find that the Maine and Wyoming models provide the most useful comparisons for the OQEM. Like the OQEM, both these models determine per-pupil funding levels based on costs of "prototype" elementary, middle, and high schools developed by professional judgment panels and education experts. The Wyoming model has been in place for two years. The Maine model was accepted in concept by the legislature in 1999, and the details are still being worked out.

Though also worth considering, the Ohio, Illinois, and Tennessee models provide a less useful basis for comparison for the OQEM. Ohio is still involved in school finance litigation and has not adopted a final reform plan. One proposed plan suggests using a professional judgment prototype model, but has not yet designed the prototype components in enough detail to be helpful to the OQEM developers. Another Ohio funding proposal is based on the Augenblick method of determining resource levels in "educationally-efficient" schools and developing statewide per-pupil funding levels based on those calculations. A modified version of this methodology was implemented by the Ohio Legislature, but was later struck down by the courts. While the proposed Ohio models are not described in enough detail to warrant much attention from OQEM developers, the final per-pupil expenditure figures calculated by the Augenblick team are included in this report for comparison purposes, since these figures are purported to be the expenditure levels in successful schools.

The Illinois State Board of Education has recommended funding levels based on an approach that combines elements of the Augenblick method and the professional judgment panel. Their model is specified at a more aggregated level than the OQEM, limiting its usefulness for comparison purposes, but it is included in this discussion where appropriate.

Tennessee also defines the components necessary for an education and distributes funding to districts on a per-pupil basis, but unlike Maine, Wyoming, and Oregon, it uses a minimum foundation program. This approach is designed to fund a "basic" education, supplemented at the local level depending on local preferences for education. Though distributed in a block-grant fashion like the other models, the Tennessee calculations are not based on prototype schools. Instead, their model specifies certain resource levels depending on district and school size. While the prototype models allocate all costs to the school level and distribute funding on a per-pupil basis, the Tennessee model keeps central district funding separate, for example allocating funding for one superintendent per district. In addition, the Tennessee model covers only

educational "essentials," unlike the Maine, Wyoming, and Oregon models which are intended to cover the full costs of an education. Hence Tennessee's per-pupil funding levels tend to be substantially lower than those of the other models. For that reason, we have not included Tennessee in the data tables in Chapter 3. However, we do briefly describe the state's program in this chapter and incorporate descriptions of the Tennessee model where appropriate in later chapters.

The Commission also requested an analysis of the New American Schools designs. These comprehensive whole-school reform models were developed in the early 1990s and represent a range of approaches for restructuring schools to raise student achievement. Since these designs are programmatic and administrative models rather than fiscal in nature, the specific parameters of each design are less useful to the developers of the OQEM than an overall sense of whether implementing an NAS design is feasible under the funding levels of the OQEM. To assess this question, we use a "standardized" NAS model developed by Odden (2000), who constructs a generalized model incorporating all the educational elements he considers necessary for whole-school reform. This standardized model is a useful proxy for the eight NAS designs, and we will incorporate it into the comparison discussions as appropriate.

The Commission was also interested in examining education reform initiatives in New Zealand. We determined that the New Zealand approach was not similar enough to the OQEM to justify its use as a comparison model, but a description of their reform policy is presented in Appendix A.

Each of the selected comparison models is described in more detail below.

MAINE'S ESSENTIAL PROGRAMS AND SERVICES MODEL

In 1997 the Maine Legislature adopted state standards known as the *Learning Results*, specifying what all students should know and be able to do at different grade levels. At the request of the legislature, the State Board of Education appointed a committee to determine an adequate and equitable level of resources that would enable all students to meet these Learning Results, and to make some general recommendations on how to hold schools accountable for achieving them. The 14-member committee consisted of State Board of Education employees, Department of Education employees, a teacher, a principal, several superintendents, and associates from the Maine Coalition for Excellence in Education and the Annenberg Institute for School Reform. They contracted with the University of Southern Maine for research and consultative assistance.

In order to determine the necessary level of funding, the committee identified essential programs and services and then estimated their costs using prototypical schools as a basis. The result is a cost-based block grant model that allocates funds to districts but does not mandate how those funds should be spent. The only exceptions are money for early childhood development, technology, and student assessments, which are made available only if districts have evidence they intended to institute the appropriate programs.

The essential programs and services identified by the committee are as follows.

Maine Essential Programs:

Career Preparation	Modern & Classical Languages
English Language Arts	Science & Technology
Health & PE	Social Studies
Mathematics	Visual & Performing Arts

Maine Essential Services:

A. School Personnel
- Teachers
- Education technicians
- Counseling/guidance staff
- Library staff
- Health staff
- Administrative staff
- Support/clerical staff
- Substitute teachers

B. Supplies and Equipment

C. Special Populations
- Special needs pupils
- LEP
- Disadvantaged youth
- Primary (K-2) grade children

D. Specialized Services
- Professional development
- Instructional leadership support
- Student assessment
- Technology
- Co-curricular and extra-curricular learning

E. District Services
- System administration
- Maintenance of operations

F. School-Level Adjustments
- Vocational ed
- Teacher ed attainment
- Transportation
- Small schools
- Debt services

The essential services do not include capital investment, capital replacement, or technology hardware, as the committee decided these should be funded under other provisions and legislation.

The committee used information from multiple sources to determine costs for the prototype components, including:

- General resource and expenditure data on Maine schools (the committee was unable to examine specific resource allocations because detailed fiscal reporting is not required in Maine);
- Data on high-and low-performing Maine schools: a commissioned study identified schools where students were performing better than predicted and worse than predicted, and looked at resource levels and program offerings;

- A survey conducted by the committee to collect data from all Maine districts on use of instructional aides, professional development offerings and funding, and extracurricular activities (amount, type, and funding);
- A review of other existing or proposed models, especially Massachusetts, New Jersey, Wyoming, and previously proposed Maine models;
- National literature on school resources and performance; and
- Expert testimony.

Based on the resulting model, the committee estimated that an additional $131.5 million would be needed to meet the Learning Standards, representing a 10 percent increase over the $1.3 billion spent in 1996-97. The committee recommended that there be a gradual transition to accommodate the increase and that an expert panel be convened to propose transition plans. It also recommended that a separate committee be established to determine how much of the funding should come from the state and how much from local sources.

The legislature took steps to implement the model for 1999-2000 by increasing the state subsidy 5.7 percent, increasing the per-pupil guarantee from $3,675 to $4,020 and increasing the local mill rate to 6.67 mills. The 2001 session of the legislature is considering further increases in the foundation level and an increase in the mill rate to 7.02 mills. It is estimated that if the new foundation level of $4,307 is funded, the per-pupil guarantee will be 74 percent of the projected adequacy model costs. The plan is to reduce that gap from 26 percent to 13 percent by 2002-03. Still to be determined is how the state distribution formula will work when the system is fully funded.[4]

THE WYOMING COST-BASED BLOCK GRANT MODEL

Wyoming's current education funding system is the result of a 1995 State Supreme Court decision declaring the state's school finance system unconstitutional (Campbell County v. Wyoming). The Court directed the legislature to specify "a proper education" and to adequately fund that program. The Court admonished the legislature against considering cost in designing its program and required that the program be the "best." It further required that there be no differences in funding per pupil except those justified by differences in cost.[5]

In order to comply with the Court mandate, the legislature defined a "Basket of Educational Goods and Services" determined to comprise a proper education, and contracted with MAP to develop a school finance system in accordance with the Court decision. The resulting model was designed and verified using several iterations of professional judgment panels. The nature and quantity of various components were imputed or based on the advice of expert educators. Developers also relied on relevant national research and published standards of professional

[4] For more information on the Maine EPS model, see the Maine Department of Education (1998) report for a full description of the school prototypes, and Silvernail (2000) for a discussion of implementation.

[5] While the resulting system does have wide disparities in nominal per-pupil funding among districts, all of these disparities are due to cost-based adjustments included in the model.

associations in designing the model. The costs of the components were generally based on market prices.

The Wyoming formula calculates a statewide base amount per pupil using prototypes for each school level. Districts receive the base amount per pupil, adjusted up or down for cost of living, teacher seniority, school size, district size and student characteristics. Qualifying district expenditures for transportation and special education are fully reimbursed. An inflation adjustment is considered every two years at the discretion of the legislature. There is no automatic mechanism for updating the costs of the services outlined in the model. Districts are allowed to spend their allotment however they choose.

The MAP model was recommended to the legislature in 1997 and was enacted over the next two years. A recent Court decision upheld most of the model, but an appeal is pending.[6]

OHIO'S AUGENBLICK METHOD AND THE BASKET OF ESSENTIAL LEARNING RESOURCES

After years of litigation, in 1997 the Ohio Supreme Court ruled that the state's education finance formula violated the constitutional mandate of a "thorough and efficient" system and declared it unconstitutional on both adequacy and equity grounds. The Court found that the existing amount of state aid was largely determined by political and budgetary considerations rather than by actual education costs. The judge further specified that education funding was the responsibility of the state rather than local governments, and called upon the General Assembly to enact a "complete systematic overhaul" of the funding system.

By the time the State Supreme Court made its 1997 ruling, the Ohio Department of Education had already begun to consider alternative funding methods in response to an earlier ruling by a lower court. The Department of Education convened a panel of experts to analyze the situation in Ohio and recommend a new funding strategy. The experts used a statistical approach to determine an adequate level of basic aid, based on actual expenditure levels in high-performing Ohio districts. Augenblick (1997), one of the expert panelists, explains the methodology as follows:

> The procedure was based on the theory that if the state could identify a set of objectives for its public schools, then a base figure could be inferred by examining the expenditures of districts that meet those objectives. The underlying assumption is that any district should be able to accomplish what some districts do accomplish, provided they have a similar amount of revenue and that amount is modified for individual districts to take into consideration cost pressures they face that are beyond their control. This approach also has the expectation that districts are given a great deal of flexibility in making choices about how to spend their revenue and that the state has an accountability system that monitors district

[6] Additional information on the Wyoming model can be found in MAP (1997a), and the Wyoming web site: http://legisweb.state.wy.us/school/cost/apr7/apr7.htm.

> accomplishments and allows the state to intervene when accomplishments are judged to be insufficient. (p1)

The experts identified Ohio districts that met desired levels of student performance as well as several other input and output screening criteria, and then averaged the per-pupil expenditures in those districts. Calculated in this manner, the base level of funding was $4,450 per pupil in 1999 dollars.[7] The panel recommended that the base level be adjusted for special education, vocational education, gifted education, transportation, facilities, regional cost, and low-income students.

Augenblick later revised the methodology and recalculated a base figure using different screening criteria. His revised figure was $4,269 in 1999 dollars. Augenblick's methodology was further revised by both the House and the Senate, until a final figure of $4,063 was settled upon. This amount was scheduled to be phased in over several years, with the initial base figure set at $3,851 per pupil. Augenblick and other outside experts did not condone the changes in methodology used to arrive at the reduced figure.[8]

In a 1998 compliance review, the Court declared that the new laws did not constitute the required "complete systematic overhaul" and found that the system remained unconstitutional. As the Ohio Legislature continues to struggle with education funding reform, a number of different coalitions and organizations have been weighing in with their own plans. One approach that may be of particular interest to the developers of the OQEM is the *Basket of Essential Learning Resources* created by the Ohio Coalition for Equity & Adequacy of School Funding (1999), the group of 500 school districts originally responsible for bringing suit against the state in 1991. Concerned that the state had failed to develop an entirely new system as required by the Court, the Coalition moved to develop its own plan by identifying the needs of a "thorough and efficient" education system. Using information collected from town meetings, teacher surveys, and a large-scale professional judgment conference,[9] the Coalition drafted and adopted the *Basket of Essential Learning Resources* in consultation with national and local experts. Much like the prototype models in Maine, Wyoming, and the OQEM, the Basket attempts to lay out the necessary components of an education program at the school level. It is still in the early stages of development, however, and does not yet include costs or detailed parameters for most of the

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[7] The original report of the expert panel is entitled "Proposals for the Elimination of Wealth Based Disparities in Public Education" June 1995, a report from State Superintendent Ted Sanders to the Ohio Legislature. A description of the panel's work can also be found in Augenblick (1997).

[8] The disagreements in methodology between the original expert panel, Augenblick's revisions, and the General Assembly's final approach concern issues such as whether 5% or 10% of outlier districts should be eliminated from the analysis, and whether outlier status should be based on per pupil expenditures or on per pupil property wealth; what criteria should be used for selecting "high-performing" districts; whether input criteria such as beginning teacher salary and pupil-teacher ratios should be used along with the output criteria as screening devices; whether an additional criteria screen of "expenditure efficiency" should be used; and whether it is appropriate to use weighted averages in calculating the final base figure. For further discussion, see Augenblick (1997), and the 1998 Plaintiff's Brief in DeRolph vs Ohio, http://www.frognet.net/~jshirey/espy.htm.

[9] The conference included school administrators, teachers, school board members, business leaders, local and state government officials, and representatives from educational and professional associations. The approximately 230 participants were divided into nine teams. It should be noted that many of the teams had difficulty reaching consensus, and that a number of participants felt they did not have enough background knowledge to accomplish the task.

components. Its current lack of detail limits its usefulness as a basis for comparison to the OQEM, but we have included a discussion of it where appropriate in Chapter 3.

ILLINOIS' PERFORMANCE-BASED METHODOLOGY

In 1996, after a six-year legal battle the Illinois Supreme Court dismissed a lawsuit brought by school districts challenging the constitutionality of school funding in the state. The Court declared that education funding was a matter for the legislature, not the courts. During the course of the lawsuit and in its aftermath, the state considered various methods of education funding reform. One approach was devised by the Illinois State Board of Education, which had been charged with developing a foundation level of student funding based on cost rather than on state budget considerations. Their approach used an analysis of "educationally efficient" schools, defined as those with high academic performance (controlling for poverty) and below-average per-pupil expenditures. Averaging the general education expenditures in these schools, the Board derived a per-pupil figure of $4,225 for 1995-96.

In a later report, the Board expanded its inquiry to examine how much an adequate education *should* cost. To do so, they considered their original work a "What Is" model, reflecting current practice. They then combined elements from the "What Is" model with program parameters they felt were desirable resulting in a "What Is / What Should Be" model that specified programs, courses, class size, number of classes per teacher, and personnel staffing levels. Costs for this model were based on actual expenditure data from the educationally-efficient schools. Finally, the Board developed a "What Should Be" model using parameters from the earlier model but cost levels they deemed more appropriate. These cost levels were considered preliminary estimates that were proxies for what would later be determined by professional consensus. Per-pupil figures in the "What Should Be" model are as follows:

$6,604 for regular K-3 elementary education;
$5,022 for regular 4 – 6 elementary education;
$5,132 for regular junior high/middle school education; and
$5,393 for regular high school education.

The legislature never adopted the approach developed by the State Board, but it did use the initially recommended funding levels as the basis for raising the foundation funding level in 1997. The FY 2000 foundation level in Illinois is $4,325.[10]

[10] For more information on the Illinois education funding system, see Illinois State Board of Education (1996 and 1998).

TENNESSEE'S BASIC EDUCATION PROGRAM

Tennessee uses a minimum foundation program to fund its schools. Under this model, the legislature determines a funding level associated with a basic education, which local districts are free to supplement it as they choose. Funding for the foundation amount is shared between the state and local governments.

Tennessee's funding formula was developed by the legislature in 1992 in response to a court ruling declaring the previous system unconstitutional. Called the Basic Education Program (BEP), the plan identifies 42[11] components considered essential to providing an adequate basic education. The foundation amount is the cumulative cost of these components, and varies by district since component parameters take into consideration district size and actual expenditures such as average district personnel salary. A regional cost adjustment is also applied to portions of the foundation to account for cost differences among districts. Component costs are reviewed annually and adjusted for inflation. The components were originally identified by the State Board of Education, and a system is in place for updating the parameters as needed. Full funding of the BEP was phased in over a five-year implementation period.

The BEP components are divided into two categories: classroom components (personnel and instructional materials), and non-classroom components (district administration, operations and maintenance, transportation, etc.). Funding generated from classroom components can only be used in the classroom. The state is responsible for funding 75 percent of statewide classroom component costs and 50 percent of statewide non-classroom component costs. The local share for each county is based on fiscal capacity, including property tax base, per capita income, resident tax burden, and the relative number of students.

In addition to the minimum foundation amount established by the BEP, the state provides supplementary funding for technology, accountability, curriculum and instruction, vocational education programs, schools for the disabled, a statewide management and information system database, adjustments for districts experiencing rapid enrollment growth, and incentive funding for schools exceeding performance standards. In 1995 the State Supreme Court mandated the equalization of teacher salaries among school districts, and the state now also provides salary equity funding.

A list of BEP components can be found in Table 2-1.

[11] A 43rd component (technology coordinators) was later added.

Table 2-1: Tennessee Basic Education Program (BEP) Components[12]

Classroom Components	Classroom Components (cont.)
Regular Education Teachers	Nurses
Vocational Education Teachers	Alternative Schools
Special Education Teachers	K-3 At-Risk Class Size Reduction
Elementary Guidance	Duty-Free Lunch
Secondary Guidance	Special Education Early Intervention
Elementary Art	Staff Benefits and Insurance
Elementary Music	Textbooks
Elementary Physical Education	Classroom Materials & Supplies
Elementary Librarians (K-8)	Instructional Equipment
Secondary Librarians (9-12)	Classroom Related Travel
Substitute Teachers	Vocational Center Transportation
Instructional Assistants	Technology
Special Education Assistants	
Principals	**Non-Classroom Components**
Assistant Principals Elementary	Superintendent
Assistant Principals Secondary	System Secretarial Support
System-Wide Instructional Supervisors	Technology Coordinators
Special Education Supervisors	School Secretaries
Vocational Education Supervisors	Maintenance & Operations
Special Education Assessment Personnel	Non-Instructional Equipment
Social Workers	Pupil Transportation
Psychologists	Staff Benefits and Insurance
	Capital Outlay

NEW AMERICAN SCHOOLS "WHOLE-SCHOOL REFORM" MODELS

The Commission specifically asked that MAP include a discussion of the New American School (NAS) designs in the comparison of different education models. In the early 1990s the New American Schools Development Corporation sponsored the development of eight comprehensive school reform models, each designed to implement schoolwide change through a complete restructuring process. The focus, structure, and content of the models differ considerably, but they are alike in their emphasis on a comprehensive, integrated approach to school reform. The NAS models are:

- Atlas Communities
- Co-nect Schools
- Expeditionary Learning Outward Bound

[12] A description of component parameters can be found at the Tennessee State Board of Education website: http://www.state.tn.us/sbe/bep.htm.

- Modern Red Schoolhouse Institute
- National Alliance for Restructuring Education
- Purpose-Centered Education: Audrey Cohen College
- Roots and Wings (Success for All)
- Urban Learning Centers

These models do not constitute comprehensive funding systems because they do not address the full costs of providing an education (they typically do not consider factors such as district costs, operations and maintenance, etc). However, they are useful examples of the different ways in which resources can be deployed to improve student performance.

In a recent article on the costs of comprehensive school reform, Odden (2000) conveniently "standardizes" the whole-school reform models by identifying a set of elements he believes ought to be included in any comprehensive school design. He then proceeds to estimate the quantities and costs of these key elements. Though his standardized model is just for elementary schools and covers only those costs associated with professional educational elements it allows us to examine how the resources in the OQEM generally compare to whole-school reform models overall, without overwhelming the reader with the details of each reform package. Therefore, we will include descriptions of Odden's standardized whole-school reform model where applicable.[13]

[13] For a detailed discussion of each NAS model, see Glennan (1998); NorthWest Regional Lab (1998); Stringfield, Ross and Smith (1996); and the NAS website: http://www.naschools.org/.

Chapter 3. Analysis of Components Across Models

Through our analysis of other state adequacy models and the national literature on adequacy, we have compiled a comprehensive list of the elements an education system might include. Below we show how each element is treated in the OQEM[14] and in each of our comparison states. We include cost comparisons and, where possible, a discussion of how costs and quantities of goods and services are determined in each state's model.

Table 3-1: Elements of an Education System

A. School Personnel	H. Assessment
Teachers	I. Food Service
Substitutes	J. Vocational Education
Paraprofessionals	
Pupil Support Staff	K. Special Populations
Librarians	Special Education
Library/Media Assistants	Limited-English Proficient Students
Nurses	Economically-Disadvantaged Youth
Principals	Talented & Gifted Students
Assistant Principals	
Clerical Staff	L. District Costs
Other Personnel	Central Administration
	Maintenance & Operations
B. Instructional Materials & Supplies	Transportation
C. Equipment	Capital Construction
D. Technology	Debt Service
E. Student Activities	
F. Professional Development	M. Adjustments
G. Extended Instruction	

DESCRIPTION OF MODEL COMPONENTS

In general, adequacy models specify quantities for some or all of the elements in Table 3-1 above. The levels of resources for each element vary, and they are not always directly comparable. This discussion compares these models to the OQEM to show how decisions made in Oregon to date compare with those in other states. Differences among the various models may be artifacts of different developmental processes, different regional priorities, or different assumptions about the education production function, rather than critical omissions or flaws in any model. It is with this caveat in mind that the following comparisons are offered.

[14] The OQEM numbers shown in this report may differ from those in previous versions of the OQEM. In the course of our review we identified several places where there were inconsistencies between parameter specifications and the descriptions of those parameters. For the purposes of this report, we revised the specifications to match the descriptions.

As described in Chapter 1, the prototype methodology for determining funding adequacy involves three steps:

1. Developing a hypothetical school that is "typical" of schools in the state;
2. Specifying the type and quantity of educational services offered by the hypothetical school; and
3. Determining the costs of those elements.

In reviewing a prototype funding model, each of these three steps must be evaluated. First, are the assumptions built into the school prototype explicit, reasonable, and reflective of the situation actually faced by most school districts in the state? If, for instance, the prototype assumes that facilities are in good repair when in fact the majority of buildings in the state are old enough to require serious repair, then the resulting model will underestimate facility needs. If the underlying assumptions in the model are not representative of schools across the state, then the model may specify a funding level that is adequate by some standards but not in the context of the state. The OQEM takes special care to detail the assumptions underlying its prototype schools. Before making funding decisions based on the model, the state must make sure that these assumptions are in fact realistic since they have important implications for school costs.

Second, is the specified educational program comprehensive, and is it likely to produce the educational outcomes desired by the state? More specifically, does the model cover the full range of educational expenses faced by schools and districts, or have some costs inadvertently been left out? Is the nature and quantity of the specified components reasonably likely to lead to the desired level of student achievement? Prototype models are usually based on schools, so district costs must be imputed and then allocated to the school level. This question is at the core of assessing adequacy, and in a professional judgment model it is addressed by education experts who rely on their experience and training to determine whether a particular prototype can produce the desired outcomes. The OQEM was primarily developed in this way.

Third, do the expenditure levels for each component reflect true costs? For the final funding levels to be adequate, the cost estimates for each of the components must be accurate. The aggregate per-pupil funding level is ultimately determined by summing across expenditure categories, so the basis and methodology for the cost estimates are vitally important.

One of the first things to be determined in constructing a school prototype is the size of the school. Enrollment is a key issue because school size affects everything from administrative structure to course offerings, and because particularly large and small schools are generally thought to face certain diseconomies of scale in providing services. For example, an elementary school of 250 students and an elementary school of 700 students both are likely to have one principal, but if the cost of the principal is calculated on a per-pupil basis it will be much higher in the smaller school. Therefore, the assumptions developers make about school size form the basis for how the rest of the model is developed.

Table 3-2 shows the school size used in the Maine and Wyoming adequacy models and in the OQEM. These figures do not represent a requirement that schools be this size; rather, they establish a basis for standardizing cost estimates for planning purposes. By estimating the resources needed to provide an adequate education in a school of this size, and computing the per-pupil costs, it is possible to ascertain how much a state must spend on the education of its children in grades K-12. Table 3-2 show that Oregon's prototype schools are larger than the prototypes in Maine and Wyoming.

Table 3-2
School Size in Prototype Models for OQEM, Maine and Wyoming

	Elementary K-5	**Middle School 6-8**	**High School 9-12**
OQEM	340	500	1000
Maine	250	400	500
Wyoming	264	300	600

A. School Personnel

Personnel represent the majority of expenditures for all school districts. This section describes how each of the categories of personnel identified in Table 3-1 are treated in the OQEM and comparison models. Tables 3-3, 3-4 and 3-5 display personnel allocations for elementary, middle, and high schools. In these tables, we have standardized each of the models to the school sizes used in the OQEM so that comparisons can be made more easily. Another way to consider staffing levels is to examine the ratio of pupils to staff for each category. This type of analysis is often more useful since the size of the school does not have to be constant to make comparisons across states. Tables 3-6, 3-7 and 3-8 provide such comparisons. Illinois appears in this table since its proposed funding system includes staffing ratios.

The staffing levels shown here do not include personnel for special education. Since some of the models specify staffing levels for special education while others simply indicate a total categorical funding amount, in order to compare consistently across models we created a separate category for special education for all models.

Table 3-3
Comparison of Elementary School Personnel FTE Units Across State Models
(School Size = 340)

Category[a]	OQEM	ME	WY	IL
Teachers	22.5	20.0	22.5	18.9
Paraprofessionals	5.0	3.4	2.6	19.5
Pupil Support		1.0	1.3	0.7
Librarians		0.4	1.3	0.5
Library/Media Ass't		0.7		
Nurses		0.4		[c]
Principals	1.0	1.1[b]	1.3	0.8
Assistant Principals				
Clerical	1.0	1.8	2.6	[d]
Total	**29.5**	**28.8**	**31.6**	**40.4**

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support Staff
[d] Model does not distinguish between clerical and paraprofessional staff

Table 3-4
Comparison of Middle School Personnel FTE Units Across State Models
School Size = 500

Category[a]	OQEM	ME	WY	IL
Teachers	24.5	31.3	29.5	25.7
Paraprofessionals	5.0	5.0	3.3	12.5
Pupil Support	2.0	1.5	3.3	1.7
Librarians	1.0	0.6	1.7	0.8
Library/Media Ass't	1.0	1.0	2.5	
Nurses	0.5	0.6		[c]
Principals	1.0	1.6[b]	1.7	1.4
Assistant Principals	1.0			
Clerical	3.0	2.5	3.3	[d]
Total	**39.0**	**44.1**	**45.3**	**42.1**

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support Staff
[d] Model does not distinguish between clerical and paraprofessional staff

Table 3-5
Comparison of High School Personnel FTE Units Across State Models
(School Size = 1000)

Category[a]	OQEM	ME	WY	IL
Teachers	53.0	66.6	55.5	55.4
Paraprofessionals	9.0	4.0	8.3	25.0
Pupil Support	4.0	4.0	6.7	5.0
Librarians	1.0	1.2	1.7	1.5
Library/Media Ass't	1.0	2.0	3.3	
Nurses	1.0	1.2		[c]
Principals	1.0	3.2 [b]	1.7	1.8
Assistant Principals	2.0		1.7	
Clerical	7.5	5.0	8.3	[d]
Total	**79.5**	**87.2**	**87.2**	**88.7**

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support Staff
[d] Model does not distinguish between clerical and paraprofessional staff

Table 3-6
Elementary School Pupils Per Staff

Category[a]	OQEM	ME	WY	IL
Teachers	15	17	15	18
Paraprofessionals	68	100	132	40[d]
Pupil Support		350	264	500
Librarians		800	264	650
Library/Media Ass't		500		
Nurses	1000	800		[c]
Principals	340	305 [b]	264	450
Assistant Principals				
Clerical	340	200	132	[e]

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support
[d] In addition, the Illinois SBE model includes one teacher aide per 20 K-3 students
[e] Model does not distinguish between clerical and paraprofessional staff

Table 3-7
Middle School Pupils Per Staff

Category[a]	OQEM	ME	WY	IL
Teachers	20	16	17	19
Paraprofessionals	100	100	150	40
Pupil Support	250	350	150	250
Librarians	500	800	300	650
Library/Media Ass't	500	500	200	
Nurses	1000	800		[c]
Principals	500	305[b]	300	330
Assistant Principals	500			
Clerical	167	200	150	[d]

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support
[d] Model does not distinguish between clerical and paraprofessional staff

Table 3-8
High School Pupils Per Staff

Category[a]	OQEM	ME	WY	IL
Teachers	19	15	18	18
Paraprofessionals	100	250	120	
Pupil Support	250	250	150	200
Librarians	1000	800	600	650
Library/Media Ass't	1000	500	300	
Nurses	1000	800		[c]
Principals	1000	305[b]	600	550
Assistant Principals	500		600	
Clerical	133	200	120	[d]

Notes:
[a] Staffing levels shown here do not include special education personnel
[b] Includes all school-level administrators
[c] Included in Pupil Support
[d] Model does not distinguish between clerical and paraprofessional staff

A word of caution is necessary before proceeding. It is easy to get buried in comparisons of the number of personnel in each category across the state models. However, before considering changes in individual personnel allocations within the OQEM, state policy makers should consider the entire staffing resources available to a school. The important consideration is whether adequate personnel resources exist to meet the educational needs of the state's students, not whether Oregon has as many aides or administrators as other states, and not whether Oregon offers the most staff by category.

1. Teachers

Teachers are at the heart of any education system, both in terms of their potential impact on student learning and their place in the budget—teacher costs are by far the greatest single expenditure category in education. It is commonly argued that small classes are the best way to deliver a high-quality education, but additional teachers can be a budget-breaking expense and many argue that resources can be used more efficiently elsewhere (see Appendix B). Because of its direct influence on student learning and its overwhelming impact on the budget, "How many teachers?" is one of the most important questions in building an education finance model.

The literature on class size is extensive but inconclusive. While many argue that lower class size leads to higher student achievement, there is no professional consensus on the "right" class size or what grades should be affected. Much of the research to-date has concentrated on the primary grades. An early study by Glass and Smith (1979) found that class size needs to be reduced to fewer than 20 students, preferably to 15, if strong impacts on student learning are to be seen. Odden (1990) also suggests that only dramatic class size reductions are worthwhile, and advocates 15 to 17 students per class. Ferguson and Ladd (1996) believe that class size should be in the vicinity of 23 to 25, and that lowering class size beyond that point will not lead to systematic improvement in student achievement.

In the midst of this cacophony of research findings, states have taken different tacks. A number of states have recently passed legislation either mandating smaller classes in elementary grades, or establishing incentive programs to finance smaller classes.[15] Most states that implement class size reduction seem to set average K-3 class size at around 20 students. Nevada has the lowest mandated size, requiring no more than 15 students per class. At the other end of the range, North Carolina has an incentive program for schools to keep K-2 classes under 23 students.

Given the range of research findings and state practices, there is no clear recommendation for class size. Among the comparison states, elementary school class size varies from 16 in Wyoming to 23 in Illinois; most of the NAS designs suggest 25. The OQEM specifies 20. Middle school and high school class sizes range from 21 in Wyoming to 29 in the OQEM. The levels set in the OQEM middle and high school prototypes are markedly higher than those in other models. However, it is important to note that there is a very real difference between class size and pupil-teacher ratio. Schools generally have a number of licensed personnel who are not

[15] A table comparing class size reduction programs across states can be found in Table 1 of Appendix B.

regular classroom teachers, and when these individuals are taken into consideration the resulting pupil-teacher ratio is often much lower than stated class size. This is a resource-allocation decision on the part of schools or districts, which decide whether certificated staff should be regular classroom teachers or fill other roles.

When we examine pupil-teacher ratio rather than class size, we find that the OQEM is much more similar to the comparison models. Table 3-9 displays class size versus pupil-teacher ratios across models. For comparison purposes, it also shows how many teachers each model would allocate for a school the same size as the OQEM prototype. The OQEM shares honors with Wyoming for the lowest pupil teacher ratio in elementary schools. The OQEM pupil-teacher ratio for middle schools and high schools is somewhat higher than in the other models.[16]

Table 3-9
Class Size versus Pupil-Teacher Ratio in State Adequacy Models

	Elementary School			Middle School			High School		
State	Class Size	Pupil-Teacher Ratio	# Teachers for 340 ADM	Class Size	Pupil-Teacher Ratio	# Teachers for 500 ADM	Class Size	Pupil-Teacher Ratio	# Teachers for 1000 ADM
OQEM	20	15.1	22.5	29	20.4	24.5	29	18.9	53.0
ME		17.0	20.0		16.0	31.3		15.0	66.6
WY	16	15.1	22.5	21	17.0	29.5	21	18.0	55.5
TN		18.8	18.1		26.2	19.1		27.3	36.6
IL	20-23	18.0	18.9		19.4	25.7	21-25	18.1	55.4
OH	18-20			22			24		

Note: Does not include special education teachers.

This suggests that overall the OQEM provides about the same number of certificated staff as the other state models, but allocates them differently. The designers of OQEM appear to place a higher priority on functions other than classroom instruction than do their counter-parts in Wyoming or Maine. Assuming that these models all take a block-grant approach and allow schools to use the funds as they deem appropriate, the differences in class size is less important than the level of professional staff available to each school and school district.

As noted above, teacher salaries comprise the single largest expenditure category for schools. District decision makers ultimately must make trade-offs among budget categories, such as between class size and teacher salary. For example, a school district could choose to raise class size and offer higher salaries in order to attract more experienced or better-trained teachers.

Each model uses a different approach to set teacher salaries. The OQEM relies on the statewide average teacher salary. Illinois and Maine use this approach as well. The Maine model also includes an adjustment for teacher educational attainment at a rate of 1.16 times the average

[16] The exception is Tennessee, but it must be remembered that Tennessee uses a minimum foundation program, and expects local districts to augment the numbers shown here.

teacher salary for every teacher in the district who has earned a masters degree from an accredited institution.[17] Tennessee sets a state salary schedule with which districts must comply, and then allocates funds to districts based on their actual average teacher salary (this has the advantage of automatically adjusting for teacher training and experience). Wyoming provides districts with the average statewide beginning salary[18] plus the imputed average amount paid for teacher education level, adjusted annually for actual teacher seniority in each district.[19] Before accepting this approach, Wyoming ensured that the salaries used for this calculation were adequate by examining application rates for vacancies, comparing beginning salaries in districts with competitive employment markets to the state average beginning salary, and comparing Wyoming salaries to those in surrounding states.

Determining the appropriate salary level to use to estimate the costs of an adequacy model is a difficult and complex issue. Teacher salaries represent an example of an input where cost and expenditure might differ. One would expect the cost of a beginning teacher to be similar to the salary that an individual with similar education, training, and experience could command in another occupation. However, the existence of bargaining units for teachers may lead to differences between what districts pay and that estimated cost. Nevertheless, it is possible to compare beginning teacher salaries with entry-level salaries in occupations that require similar qualifications. In Wyoming, MAP found that there was very little difference between average beginning teacher salaries in the two largest professional job markets in that state and the salaries paid to others with similar qualifications. A similar analysis has not been done for Oregon. For now, existing salaries are used to estimate the cost of teaching inputs to the OQEM. Oregon may want to revisit this question in the future.

2. Substitute Teachers

Substitute teacher costs were not included in the initial OQEM. They clearly should be included as they represent an important component of total compensation for teachers. We understand that the ODE staff is using DBI data to estimate the costs of substitute teachers for schools of the prototype size, and that these estimates will be included in the next iteration of the model.

The Maine model provides substitute teachers at a rate of 0.5 days per pupil, based on a statewide survey showing that teachers are absent from illness the equivalent of one-half day per pupil per year, on average. Wyoming sets the number of substitutes at 5 percent of the number of prototype classroom teachers. Tennessee does not address the number of substitutes but allocates a per-pupil amount for them. Illinois does not directly address substitutes in its model, though they may be included under another expenditure category.

[17] This adjustment is based on an analysis of data on Maine teachers indicating that teachers with masters degrees earn approximately 16 percent more than their bachelor-degree counterparts.

[18] Based on an analysis of Wyoming labor markets, it was determined that the average beginning teacher salary approximated the economic cost of beginning teachers. It is altogether possible, however, that cost equaling expenditures in this case was coincidental.

[19] The Wyoming regional cost adjustment permits local districts in higher-cost areas to offer higher salaries to compensate for the higher cost of living.

The Maine model allocates substitutes $50 per day, while Wyoming provides $60 per day. Tennessee gives $34 per ADM (the equivalent of $68 per day if the Maine level of half-day per pupil were used). The substitute salary in the Maine and Wyoming models was set at the state average; cost derivations in the Tennessee model were not explained.

3. Paraprofessionals

The "Paraprofessionals" category includes a number of types of classified staff, the most common of which are instructional aides. There is some controversy in both practice and the literature over whether instructional aides are an effective use of resources. Most recently the Tennessee STAR study provides compelling evidence that instructional aides do little to improve student performance is classes with an average of 23 students. Nevertheless, several models include instructional aides although schools can allocate the funding for other purposes.

The OQEM does not include funding for instructional aides specifically, but it does fund a variety of other classified positions such as records clerks, playground supervisors, parental involvement staff, campus monitors, community outreach staff, and volunteer coordinators, among others. For the purpose of this report, these classified staff positions are aggregated into the paraprofessionals category.[20] Schools have the discretion to distribute positions as they see fit. The OQEM allocates one classified staff position for every 68 elementary students and one classified position for every 100 middle and high school students.

Maine's model recommends a ratio of one instructional aide per 100 students for grades K-8 and one aid for every 250 secondary students. Wyoming uses a ratio of 1:132 for elementary schools, 1:150 for middle schools, and 1:120 for high schools. Tennessee provides instructional aide funding only for the primary grades, with a ratio of 1:75 in grades K-6. Illinois funds instructional aides in grades K-3 at a ratio of 1:20. In addition to instructional aides, Illinois budgets one classified staff for every 40 elementary pupils. The other states do not appear to distinguish between instructional aides and other types of classified staff.

4. Pupil Support Staff

Pupil Support Staff includes guidance counselors, school social workers, psychologists, and the like. The demand for these services is growing substantially as school-based mental health services gain popularity and educators place higher importance on the role of guidance counselors. The ratio of pupil support staff provided at the elementary level ranges from 1:264 in Wyoming to 1:500 in Tennessee and Illinois. The NAS designs, especially those targeted at high-poverty urban schools, tend to place particular importance on providing coordinated social services. This can range from a single family outreach coordinator (1:500) to a four-person team including family liaison, guidance counselor, social worker, and nurse (1:125).

[20] In some cases it was difficult to distinguish between paraprofessional positions and clerical positions. In these cases, the best judgment of the authors was used.

At the middle school and high school levels, the range runs from 1:150 in Wyoming to 1:350 in Tennessee. The OQEM does not specify any pupil support staff at the elementary level, but its allocations for middle school and high school are typical of those found in other models. See Tables 3-4 and 3-5.

5. Librarians

There is enormous variation in the ratio of librarians to pupils across the comparison models. Maine recommends a ratio of 1:800 across school levels, whereas Illinois uses 1:650. Wyoming provides one librarian in each of its prototype schools, for a de facto ratio of 1:264 in elementary schools, 1:300 for middle schools, and 1:600 for high schools. Tennessee allocates one librarian for each school over a certain size, with additional positions for larger high schools. Nationally, the ratio of librarians per pupil is 1:885 (NCES, 1998). The OQEM provides no library staff at the elementary level, and uses ratios of 1:500 and 1:1000 at the middle and high-school levels.

6. Library/Media Assistants

The use of library and media assistants among the comparison models varies even more widely than the number of librarians. Three of the states, Oregon, Wyoming and Illinois do not specify any library/media assistants at the elementary level. Illinois' model does not include these positions at any level, and the ratio of pupils to such assistants varies from a low of 200 pupils per library/media assistant in Wyoming middle schools to a high of 1,000 in a number of states and school levels. (See tables 3-6 through 3-8 for details). Note that Tennessee's model places aides in libraries based on the enrollment of the school and relies on school size to ascertain whether or not additional aides are needed.

7. Nurses

It is difficult to compare the number of nurses across models since each model treats this category differently, probably reflecting significantly different regional practices. Wyoming includes them with pupil support staff and does not discuss them separately. Tennessee does not allocate nurses at the school level, but rather funds one nurse for every 3,000 students in the district. Maine recommends one nurse for every 800 students in a school. The OQEM does not specify nurses at the elementary level, but provides 1 nurse for every 1000 students at the middle and high school levels.

8. Principals and Assistant Principals

Schools generally have one principal, with the exception of very small schools which sometimes have no administrator or share an administrator with other small schools. Wyoming, Maine, and Illinois all allocate principals based on per-pupil ratios. As a result, schools larger than the given prototype receive funding for more than one administrative position, while schools smaller than the prototype receive funding for a fraction of a position. For instance, a Wyoming middle school of 400 students (100 more than the prototype) generates funding for 1.3 principal positions, while a school of 250 receives funding for 0.83 principals. This funding allocation

method may lead to inefficiencies, since it is likely that the larger school will only hire one principal and use the excess funding elsewhere, while the smaller school will probably want a full-time principal and draw funding from other sources to make up the difference. Tennessee uses an alternative approach: it provides funding for one principal for each school with enrollment greater than 225. Though this method has some advantages, the somewhat arbitrary and abrupt cut-off point may create difficulties for schools just below the cut-off point. Each of these allocation methods has advantages and disadvantages in terms of efficiency.

Assistant principals are generally not funded at the elementary or middle school levels, with the exception of Tennessee, which provides assistant principal positions for larger schools. At the high school level, Wyoming provides one assistant principal for every 600 students, while Tennessee uses a tiered approach that depends on school size. Maine and Illinois both provide ratios for administrative staff in general, making it impossible to distinguish between numbers of principals and assistant principals. At the middle school level, the Maine and Illinois ratios are very similar, both slightly over 1:300. At the high school level they vary much more -- 1:305 in Maine compared to 1:550 in Illinois. This may in part be a function of differences in average school size in the two states.

Considering principals and assistant principals together, the OQEM provides one administrator for every 250 middle school students and one administrator for every 400 high school students. While the middle school ratio is lower than that the of other models, the high school figure appears to be within the broad range of the other models.

9. Clerical Staff

Clerical staff include school secretaries, bookkeepers, and other administrative support personnel. It is difficult to compare staffing patterns across models because states include different personnel categories under clerical staff, and there is some overlap with the paraprofessional category.

Tennessee allocates one secretary per school, except for schools under 225 students, which receive funding for one-half of a secretarial position. Maine recommends a ratio of 1:200 at each school level. In the Wyoming model, the ratios are 1:132 for elementary schools, 1:150 for middle schools, and 1:120 for high schools. The OQEM figures are 1:340 for elementary schools, 1:167 for middle schools, and 1:133 for high school.

At the secondary levels the OQEM figures are very close to Wyoming’s and below Maine’s. Because the distinction between clerical and paraprofessional staff is uncertain, it is useful to look at the two categories together in order to get a clearer picture of classified staff levels. When considered jointly, it appears that the OQEM has a generous allocation of classified staff.

B,C and D. Instructional Materials & Supplies, Equipment, and Technology

We have chosen to discuss instructional materials and supplies, equipment, and technology together in one section because differences in categorizations across models made it impossible

to disaggregate them credibly. One result of these difficulties is that figures could not be standardized for cost comparisons. Thus, each model is discussed separately.

In Maine the comparable category includes supplies and equipment for curriculum and instruction, student services, staff and administrative functions, and computer software but not hardware. In 1996-97 average state expenditures for supplies and equipment were $235 per pupil for K-8 and $375 for 9-12. The developers of the Maine model felt these averages were artificially low because schools had had to cut back on their supplies and equipment budgets in recent years due to funding constraints. Hence they recommended levels of $285 per pupil in grades K-8 and $430 per pupil in grades 9-12. No detail is provided on specific levels of resources within the supplies and equipment categories. Computer hardware installation and replacement costs were considered capital investments that should be funded in a separate category outside the model. On the other hand, the Maine Commission did recommend that the model include costs for on-going training and support personnel, given the importance of training teachers to effectively use the new equipment. They allocated $175 per pupil for this purpose.

The Wyoming model provides $228 per K-5 pupil, $215 per 6-8 grade pupil, and $271 per 9-12 grade pupil for Supplies and Instructional Materials, including items such as textbooks and workbooks; paper, chalk, and pencils; and day-to-day clerical and custodial needs. This represented a significant augmentation of previous statewide expenditures and provides for a five-year textbook replacement cycle. A separate Equipment category covers instructional computers, calculators, globes, scientific equipment, etc, and is funded at a rate of $144 for grades K-5, $150 for grades 6-8, and $175 for grades 9-12. Costs reflect existing Wyoming district practice in the year the model was constructed, 1996-97.

Tennessee provides $51 per ADM for textbooks, $41 per regular[21] ADM for Classroom Materials & Supplies, $40 per regular ADM for Instructional Equipment, and $22.31 per ADM for Technology, for a total of $154.31 per ADM (1999-2000 figures). No description of what these categories include is provided.

The Illinois model simply provides a lump sum for Supplies, listed as $318 per pupil. No description of this category is given.

In his standardized NAS model, Odden recommends $250 per pupil for technology to cover computer hardware and software purchases ($125,000 for an elementary school of 500). He estimates this as the amount it would cost a school to install the appropriate technology if it started from scratch, but notes that it should be considered an on-going operational cost, since computers and software become obsolete and need to be replaced regularly, and because of system maintenance costs.

The OQEM is more specific than the other models in its specifications for supplies, equipment, and technology. The subcomponents and per-pupil costs are shown in Table 3-8 below.

[21] Separate levels of funding are specified for special education and vocational education students; see those sections of Chapter 2.

Table 3-8
OQEM Supply, Equipment, and Technology Costs Per Pupil

Category	K-5	6-8	9-12
Supplies, Books & Materials			
Texts, consumables	$60	$60	$75
Classroom materials & equipment	$113	$126	$159
Copying	$25	$21	$22
Media center materials	$12	$18	$34
Teacher reimb. for out-of-pocket exps.	$10	$10	$10
Subtotal	$220	$235	$300
Technology (Hardware & Software)	$65	$48	$52
Total	**$285**	**$283**	**$352**

In the technology category, the model assumes one computer for every 6 students as well as one computer for each instructional and administrative staff member, and provides funding to purchase 20 percent new computers each year at $1,000 per computer. An additional $150 per new computer is allocated for software.

In the media center materials category, an annual survey conducted by the School Library Journal can provide a useful basis for comparison to the costs in the OQEM. Findings from the 1997-98 survey are presented in Table 3-9 (Miller and Shontz, 1999). The small sample size, low response rate, and nature of the sample limit the usefulness of these figures, but they still can be considered a rough guide for comparison. Both median and mean figures are presented here because the data are not normally distributed.

Table 3-9
National Library Media Center Per-pupil Expenditures by School Level, 1997-98

	Elementary		Middle School		High School	
Category	Median	Mean	Median	Mean	Median	Mean
Books	$7.45	$10.65	$7.56	$9.43	$6.07	$11.12
Periodicals	1.22	1.54	1.63	2.08	2.44	3.45
Microforms	0.75	0.85	1.44	1.43	1.59	2.33
AV materials	1.22	2.53	1.10	1.82	1.33	2.05
Computer Software	0.91	2.42	1.07	1.75	1.70	3.10
CD-Roms	0.80	1.35	0.95	2.13	1.88	3.40
Total	**19.00**	**28.57**	**18.77**	**21.97**	**18.85**	**42.94**

Note: Totals include federal funds, grants, and gifts; other figures are state/local expenditures only.

Compared to these national survey data, the elementary budget for media center materials in the OQEM appears lower than average, but the allocations for middle school and high school are within the normal range.

The total OQEM supply, equipment, and technology allocations are $80-95 lower than Wyoming's, depending on school level. This difference is probably underestimated, since the Wyoming figures are for 1996-97 while the OQEM budget is for 1998-99. (Wyoming's numbers are scheduled to be updated for an inflation adjustment in the coming year.)

Factoring out hardware costs, which are not included in the Maine model, the OQEM allocations are about $50 per pupil lower at the elementary and middle school levels, and roughly $120 per pupil lower at the secondary level. Once again, these differences are compounded by inflation since the Maine figures are for 1997-98. However, inflation has been low and many technology costs have actually been declining.

Most of the OQEM supply and equipment costs are based on 1988 actual Eugene School District costs, extrapolated to 1999 using the CPI multiplier. Current expenditures were thought to underestimate supply and equipment needs, since districts substantially reduced their budgets in these areas following the passage of Measure 5. There are two alternative approaches that the state might consider to estimate these costs more accurately. One is to survey school personnel to estimate the level of supplies and equipment they feel would be appropriate, and then calculate the cost of providing that level of supplies and equipment. An alternative would be to look at district expenditures in these categories in other states where fiscal constraints have not been as severe, and determine the percentage of expenditures devoted to supplies and equipment.

The OQEM levels of students per computer are comparable to the national average of 5.7 (Dunn and Bradstreet, 1999), and its method of using market prices to determine costs is appropriate.

E. Student Activities

Student activities include athletic events, debating teams, student governments, clubs, and in some cases drama and coaches or other team sponsors. Budgets for student activities vary tremendously across school levels and models.

The Maine Commission reviewed the existing literature on the effects of student activities on student academic, physical, and social development, and decided that such activities were worth funding, despite inconclusive evidence on their effects. The Maine Commission conducted a district survey to ascertain current student activity expenditure patterns, and recommended using the statewide averages of $25 per elementary student and $58 per secondary student. They further recommended undertaking a more comprehensive study to determine how extra-curricular programs support Maine's *Learning Results* and adjust costs accordingly.

Wyoming calculated a total cost for student activities based on the statewide average after compensating for anomalies due to school size, location, and accounting practices. Then Wyoming school business officers were consulted to determine how to allocate the total funding among school levels. They established figures of $14 per elementary student, $95 per middle-school student, and $275 per high-school student. Qualified student activity costs are reimbursed 100 percent in very small and remote schools where per student costs are dramatically higher

than in larger schools. These numbers are substantially higher than those used by Maine at the middle and high school levels.

The OQEM does not specify funding for student activities at the elementary school level. It allocates $157 per pupil at the middle school level and $219 per pupil at the high school level. Since there is little research on the effectiveness of student activities on student performance, and since much of the impact of activities may be on general student well-being rather than on academic factors, funding levels for student activities should be at state discretion.

F. Professional Development

Though not typically a major expenditure category, professional development for teachers is an important and potentially cost-effective means for improving student performance. Some research suggests that it is a more efficient and effective way of raising student achievement than the more popular class size reduction (see Appendix B). Darling-Hammond (2000) claims that "each dollar spent on improving teachers' qualifications nets greater gains in student learning than any other use of an education dollar." She goes on to advocate that states allocate at least 1 percent of education funding to high-quality professional development, and that they should also provide matching funds to districts to support an increase to 3 percent of total expenditures. Along with this increased investment in professional development funding, she argues that states need to develop better professional development programs, since current offerings tend to be relatively ineffective "hit-and-run" workshops rather than aligned, on-going programs.

In determining a level of professional development funding, the Maine Committee reviewed the scant existing literature on the subject and found that funding ranges from 2.0 – 3.6 percent of a school district's operating expenditures. Since the Maine Department of Education does not collect information on professional development expenditures, the Maine Committee conducted a statewide district survey and found that reporting districts spent roughly $50 per pupil (1.4 percent of total school expenditures), and included this funding level in its model. The Committee also recommended that particular types of professional development are best designed and delivered at the state level, and that these programs should be funded separately from the model.

Based on a review of the literature and the advice of Wyoming educators, Wyoming funds professional development at a level of roughly 1.5 percent of the foundation amount, varying slightly by school level ($92 per pupil for elementary schools and $100 per pupil for secondary schools).

Odden allocates $120 per elementary school pupil for professional development in his standardized NAS model, noting that this figure is on the high end of the funding spectrum. This level of funding is sufficient to cover a two- to three-week summer institute for all professional staff and 20 days of training during the school year. Whole-school reform models generally require intensive professional development because the new philosophy and methods they advocate often necessitate substantial re-training of teachers and staff.

The OQEM provides 10 days of professional development per teacher, at $200 per day. Along with allocations for other staff training, this totals $160 per elementary school pupil, $139 per middle school pupil, and $135 per high school pupil, accounting for roughly 2.1 - 2.5 percent of the budget. These funding levels are more generous than those in the comparison models, and come from expert recommendations based on experience with Oregon Department of Education programs.

G. Extended Instruction

Unlike the other states' models, the OQEM has a funding category for additional instruction time for students to achieve standards. The Maine and Wyoming models deal with this issue in their adjustments for economically-disadvantaged youth[22] and special education, the assumption being that these children are the ones that may require extra help. The approach currently used by the OQEM contains imbedded assumptions about the number of students who will require extended instruction services. Since this will vary by district, we recommend that the Commission consider establishing adjustments based on district student characteristics. For more information, see the section on Economically-Disadvantaged Youth below and the Distribution Issues section of Chapter 4.

H. Assessment

Assessing student performance is particularly important in a block-grant system because the state focus is on outputs rather than inputs. Instead of specifying educational inputs and controlling how schools use their resources, the state provides districts with what it considers adequate funding and holds schools responsible for achieving acceptable academic results. Assessment becomes a key aspect of accountability under this type of system. Some states use statewide testing programs, while in other states local districts develop their own assessments. The amount of funding allocated to assessment at the district level will of course vary depending on how much test development districts are expected to do.

Maine, which provides some state testing but expects districts to supplement it in many subject areas, reviewed national literature on the cost of developing and maintaining such assessment systems. They found that estimates vary from $37 to $298 per pupil, and decided to budget $100 per pupil. However, districts must adopt a development plan and apply for funding.

Wyoming has implemented a statewide testing system, and includes $25 per pupil in its model for district-level assessments. The other comparison models do not specify district assessment funds.

[22] The developers of the Wyoming model were aware that not every low income student needs extra help or that every student needing help was from a low income family; however economic disadvantage correlates highly with a need for academic assistance. Moreover, tying extra funding to such a measure which is beyond the direct control of district personnel avoids the potential perverse incentives associated basing extra funding on the number of students failing.

Since Oregon has a statewide assessment system, it is not necessary to provide large amounts of assessment funding in the OQEM at the district level. However, the OQEM currently contains no allocation for assessment (although it may be assumed in the cost of instruction), and the Commission might want to consider including a small amount such as Wyoming's so that districts have the option of developing local performance assessments. In addition, the state could consider funding districts and schools for personnel time necessary for the coordination, administration, and analysis of the state assessments. Picus (1996a; 1996b) found that in Vermont and Kentucky, there are substantial district level costs associated with state assessment practices.

I. Food Service

The comparison models all either assume that school food service programs will be self-supporting, or do not allocate funds for this purpose within the models. The OQEM follows a similar practice at the elementary level, but includes $12 per high school student.

J. Vocational Education

In the Wyoming model, there is no separate category for vocational education funding in the prototypes; costs are included in other categories as appropriate. While the model was under construction, there was some discussion as to whether it should include an adjustment for vocational programs, but in the end the developers felt that an adjustment was unnecessary because vocational education costs were sufficiently built into the prototypes. Decision makers concluded that while districts vary in the amount they spend on vocational programs, these differences are due to factors such as local preference and perceived need for vocational education, which do not need to be accommodated through the state finance system.

The Maine Committee recommends that vocational education continue to be funded as a program cost until a statewide study can be conducted on the equity of the provision of vocational education programs across the state and the effectiveness of program structure. The Committee foresees the eventual development of a vocational education adjustment based on school or district characteristics and not distributed on a per-pupil basis.

Tennessee provides funding for one teacher for every 20 full-time-equivalent vocational education students, as well as a supervisor for every 1,000 such students. It also funds one technology coordinator per district, with an additional coordinator for every 6,400 ADM. The model also includes $98 per vocational pupil for classroom materials and supplies, $82 per vocational pupil for instructional equipment, $14 per vocational pupil for classroom-related travel, and $26 per technical exit exam. These figures replace the comparable numbers for regular education students.

The OQEM is silent on the topic of vocational education. If the model results in a block grant funding system that gives local districts discretion on how to spend the resources generated, then decisions regarding how to allocate personnel, supplies and instructional materials (including computers and specialized machinery) to programs – including vocational education – are best

left to local districts. The adequacy of resources to meet the programmatic needs of vocational education is an important consideration, but since most costs in the OQEM have been estimated from the DBI or other sources of salary information, it is likely that the costs of vocational education are included in the costs that have been computed to date. Other distributional issues are discussed in more depth in Chapter 4.[23]

K. Special Populations

1. Special Education

Funding for special education students is a complex and difficult problem for education officials. Federal law requires schools to provide appropriate services for students with disabilities. Nationally roughly 13 percent of students are disabled (NCES, 1998). According to a report from the Center for Special Education Finance (Parrish et al., 1997), just over half of the states use a separate funding mechanism for special education; the remaining states distribute special education funds through their general aid formulas. There are four main types of special education funding formulas: pupil weights, flat grants, resource-based, and percent reimbursement.

Under the pupil weighting system, funding is allocated on a per-pupil basis based on a given weight. For instance, if the weight is 2.0, then special education students receive twice the funding allocated for general education students in that district. Weights are usually differentiated on the basis of student placement (e.g. pull-out program, private residential), disability category, or a combination of the two. In Georgia, for instance, weights are determined by type of disability, varying from 2.27 for self-contained learning disabilities to 5.541 for the profoundly impaired. States using the pupil weighting method cite several strengths, including equity, predictability, reasonable reporting burden, and flexibility in resource use. However, states also noted that this approach can create incentives for misclassifying and over-identifying students.

Under the flat grant system, a fixed amount per pupil is allocated for each special education student. Some states limit the eligible counts of disabled students in a given district to a certain percent of total ADM, such as 12.5 percent in North Carolina. Some advantages of the flat grant approach are that it does not encourage the over-identification of special education students, it encourages early intervention and prevention, and it is easy to understand. On the other hand, flat grants can result in under funding for some districts, given the variability in types of student conditions; they are not linked to student achievement; and they are not based on actual costs faced by districts.

In resource-based systems, funding is allocated for specified types of resources, for example teachers or equipment. Rates for particular units are generally derived from prescribed student-staff ratios that vary by disability condition or placement. The advantages of this system are its

[23] A more detailed discussion of vocational education funding can be found in *Wyoming Education Finance Issues Report: The Feasibility of Developing a Cost Adjustment for Vocational-Technical Education Programs*. MAP, 1998.

relatively simple administration and freedom from over-identification or misclassification of students. Disadvantages include lack of flexibility in how resources are used and an inequitable distribution of resources.

The percent reimbursement method distributes special education funding to districts based on their actual expenditures. Districts may be fully or partly reimbursed for their program expenditures. There are usually criteria for determining which types of expenditures are eligible, and some states cap the total number of students in each district who can be claimed for funding. The major strengths of this approach are that it is based on actual expenditures and that as long as there is substantial district match, it is less likely to create an incentive for over-identification or particular types of student placement. The weaknesses are that it can be a substantial administrative burden, and unless cost ceilings are imposed it can cause difficulties in cost control.

As of 1994-95, roughly 40 percent of states used formulas primarily based on pupil weights, with the remainder evenly divided between the other three approaches.

The Maine model recommends a pupil-weighting formula for special education, using a weight of 2.1, which reflects current practice. However, the Maine Committee notes that standardized procedures for identification need to be developed and implemented, since a review of special education data revealed that identification criteria are being applied inconsistently across districts. They also suggest creating a waiver process whereby districts can receive additional state funding for pupils with certain high-cost disabilities, for whom the 2.1 weight may be insufficient.

Before its latest education reform initiative, Wyoming reimbursed districts for 85 percent of their special education costs. Under the new model the state provides reimbursement for 100 percent of costs. The Wyoming consultants recommended against using the 100 percent reimbursement rate because it does not provide any incentive for districts to control costs or provide early intervention that frequently decreases the need for special education, and instead advocated using a modified census-based approach. School districts would have been funded at a flat rate based on historical incidence of low-cost, high-incidence disability students. The state would have reimbursed 100 percent of the costs of low-incidence, high cost disability students. The Wyoming Legislature rejected this approach presumably based on the assumptions that it might not reimburse districts for actual costs, and because of the difficulty in obtaining the necessary information.[24]

Tennessee uses a variation of the resource-based method for funding special education. Its basic aid funding formula includes calculations based on specified staff ratios and allocations for other expenditure categories, although districts can use the funding as they choose.

The OQEM uses a mixture of approaches. Expenditures for low-incidence, high-cost special education students are fully reimbursed and are not included in the model. The prototypes

[24] For more information on the census-based approach, see the discussion in Parrish (1997) and MAP (1998b).

provide a flat amount per pupil for special education students in self-contained schools and others not served at the building level. Costs for the remaining special education students are included in the model, which provides resources for additional special education staff.

Since the state fully funds the costs of high-needs special education students, the real issue regarding special education costs in the OQEM has to do with the adequacy of the special education provisions for non-high-need special education students. The model calls for 1.5 special education staff in elementary schools, 2.5 in the middle schools, and 3.75 in the high schools. In addition, funding is included for a number of special education services. These figures are based on data generated through the DBI, and will likely generate an accurate estimate of current total costs to the state. However, at the district level the adequacy of special education funding depends on the incidence of children with disabilities and the services they require. Therefore, targeting special education funding appropriately to districts is a key distributional issue. The distribution method ultimately chosen by policy makers may have implications for the total costs to the state, because of the incentive system intentionally or unintentionally created. In light of this, lawmakers need to carefully consider the consequences of various distribution schemes.

Oregon also needs to address the special education costs borne by the Education Service Districts (ESDs). While the Resource and Cost Panel has recommended that ESD costs eventually be included in the model, they are not included at the present time. Since the level of per-pupil support for special education provided by ESDs varies across the state, leaving ESD special education costs and expenditures out of the model is a serious shortcoming of the current model. It is possible to include the costs of special education provided by the ESDs in the prototype model, and then allow districts or schools to contract with the ESD to provide special education services. This could be done either through formal contracts or through a distribution model that simply allocates some of the resources a school generates directly to the appropriate ESD.

2. Limited English Proficient Students (LEP)

According to a 1996 report prepared by the Education Commission of the States, roughly 25 states provide additional funding for LEP students, ranging from a fixed amount per pupil to a weighting of 1.25. Little reliable information on costs for LEP services exists, but two research studies (Parrish, Metsumot, and Fowler, 1995; and Parrish, 1994) estimate that LEP students cost an additional 15 percent above average regular education costs. Both Maine and Wyoming used this estimate to set a level of funding for their LEP students. Maine also recommend conducting a study to determine how long it should take students to achieve English proficiency, and limiting the LEP weighting to that number of years for individual pupils.

The OQEM model provides for an additional half-time teacher for ESL services at the elementary school, middle school and high school. In addition, it would seem possible for schools to use the additional course staffing they receive at the middle school (4.0 FTEs) and high school (8.4 FTEs) levels for this purpose if there were large number of LEP students. At the elementary level, the additional 4.5 program specialists could also be used for this propose at school or district discretion.

3. Economically-Disadvantaged Youth (EDY)

Research has demonstrated that economically-disadvantaged students tend to require additional resources if they are to achieve at levels similar to their more advantaged peers. However, the actual cost of successful programs for disadvantaged youth are not well established. While most states provide some additional funding for at-risk students, practices vary widely. Some states set a fixed amount per identified pupil, but more commonly a weighting factor is applied, ranging from 11.5 percent to 25 percent above regular per-pupil funding. In some states, at-risk funding is limited to the primary grades or to schools or districts with high concentrations of poverty. Colorado employs a mixed approach: districts receive 11.5 percent of their per-pupil funding for each at-risk pupil, and those with higher concentrations of at-risk students receive an additional percentage.

The Maine model recommends a 1.02 per-pupil cost factor for all students who qualify for free or reduced-price lunch. Wyoming allocates $500 per identified student only to schools where the number of students who qualify for free lunch exceeds 150 percent of the state average. Converted to a weighting factor, this would be approximately 8 percent above the per-pupil base. Tennessee does not use either a flat grant or a weighting factor, but provides funds to reduce class size in grades K-3 for free-lunch students. Illinois provides a graduated flat grant per low-income pupil based on the concentration levels of poverty in the district. For instance, districts with 20 to 35 percent of students designated low-income receive $800 for each identified student; districts with 35 to 50 percent low-income concentration receive $1,243 for each low-income student; districts with 50 to 60 percent receive $1,600; and districts with over 60 percent poverty receive $2,000 for each low-income student. Converted to a weighting factor, supplementary funding for disadvantaged youth ranges from 18 to 46 percent above the state's foundation level ($4,325 in FY 2000).

The OQEM does not appear to address funding for at-risk youth specifically. However, the model assumes a certain percentage of low-income students in its prototype schools, and the prototypes are designed accordingly to meet the needs of these students. How to target funding to districts with higher proportions of low-income students is a distributional issue.[25]

4. Talented and Gifted Students (TAG)

Based on a standard measure of intelligence, "gifted" students are generally found to comprise 2 percent of the student population, though according to the 1998 Digest of Education Statistics roughly 6.5 percent of public school students across the country participate in programs for the gifted. Some states use a broader definition of gifted to encompass students with special talents or multiple measures of intelligence. Roughly 40 states provide additional support for gifted students, through funding mechanisms such as pupil weights, flat dollar amounts for eligible students, or competitive grants for special programs (Gold, Smith, and Lawton, 1995).

[25] For further discussion about funding for disadvantaged youth, see MAP (1998c).

Wyoming assumes that 3 percent of students in each district are eligible for gifted funding, and allocates $150 per identified student (this works out to $9 per total ADM). The Maine Committee makes only a short reference to Gifted and Talented programs, stating that these programs are important to the students who participate in them and that current levels of funding should continue. They also recommend that the programs be expanded to serve more students, but do not suggest what percent of the student body or what level of funding is appropriate. The 1996-97 funding for Gifted and Talented programs was $34 per total ADM.

The OQEM does not include funding for Talented and Gifted programs in its prototypes.

L. District Costs

1. Central Administration

Central administration includes the office of the superintendent, support staff, Board of Education expenses, and business and fiscal services. In some models specialized support services such as speech pathology and psychological services are provided at the district level. This category is difficult to compare across models because of different state accounting practices and district services.

Maine allocated 4 percent of district expenditures for central administration services, based on current state practice. This amounts to $225 per elementary pupil and $270 per secondary pupil. No detail is provided on what costs are included in this category.

Wyoming provides district administration funding at a rate of $554 per pupil. This amount was based largely on current statewide average expenditures. All expenditures that reasonably could not be attributed to the school level were aggregated into the district administration category.

The OQEM allocates $208 per pupil for central administration, covering executive administration, business services, personnel services, and public information. This figure is based on DBI pilot district average costs, and may need to be updated when additional information is available.

2. Maintenance & Operations

The Maine Committee recommended rates of $625 per elementary pupil and $825 per secondary pupil, based on current state practice.

Wyoming engaged MGT, a consulting company specializing in facilities, to conduct a comprehensive assessment of every Wyoming school building and develop a formula that considers both enrollment and facility size. The revised formula is currently being enacted to replace the existing rates, which were based on average statewide per-pupil expenditures. New per-pupil averages are not yet available. The Wyoming model also includes separate funding for custodians in its personnel section.

The OQEM provides $402 per pupil for maintenance and operations, based on average pilot DBI data adjusted for deferred maintenance. This covers regular building maintenance, as well as non-bondable costs including all facility repairs and improvements. An additional $59 per student is provided for other support services (warehouse, courier service, community facilities). The Resources and Costs panel of the OQEM Commission calls for increasing the per-pupil costs for operations and maintenance from $402 to $575. They argue the reason for this is Oregon school districts currently spend approximately 9 percent of their resources on maintenance and operations, and American School and University magazine calls for spending something on the order of 13 percent.

The problem with this analysis it is based on data from many other locations. There are a wide range of factors that could impact maintenance and operations costs. Examples include:

- Age of the buildings
- Square footage of the buildings
- Average wages for individuals in the maintenance and operations job market
- Efficiencies and/or inefficiencies in the design of buildings.
- Number of students using the buildings.

Since all of these factors will impact the costs of maintenance and operations, we recommend that the state develop a cost system that allocates resources to school districts for maintenance and operations based on factors that appear to impact their actual costs. Models that allocate funds on the basis of square footage, the age of the building, or relative wages in the related workforce offer certain advantages, but also may encourage inefficient practices such as continuing operations in obsolete buildings or maintaining surplus capacity. Absent more accurate data on the size and age of school buildings and on local salary markets[26], it is impossible to ascertain how the figure of $402 currently in use should be changed, but it seems likely it will differ considerably from district to district.

3. Transportation

Transportation costs are largely a function of population density and district geography, but they also reflect district choices to at least some degree. Districts have different policies for student transportation eligibility—some districts provide free transportation for all students, regardless of how close to school they live, while others provide transportation only for those living outside city limits or at least a mile away from school. Since much of transportation costs are outside district control, both Maine and Wyoming chose to fully reimburse transportation expenses at 100 percent of cost. Wyoming, however, imposes eligibility criteria, specifying the conditions under which students will be transported. Transportation for student activities is also fully reimbursed, but only under specified conditions.

The Maine Committee reluctantly recommended continuing to fully reimburse transportation costs until a complete study of transportation issues could be undertaken. They note that

[26] Wyoming compensated for differences in local salary markets through a regional cost adjustment.

although a substantial part of transportation costs is beyond district control, efficiency does play an important role. A review of individual district profiles revealed that in some cases one district was paying twice as much as another district to transport the same number of students over the equivalent distances, and that interviews with involved school officials implicated efficiency problems as one likely reason. Tennessee uses a formula to allocate funding to districts that provide transportation, based on the number of pupils transported, miles transported, and density of pupils per route mile.

The OQEM model assumes that transportation continues to be reimbursed at 70 percent of district costs. The problem with this approach is that districts with larger transportation needs due to population sparseness have to spend more of their own resources. The rationale for this approach is that it keeps transportation operations efficient if districts share in the cost. While that is probably true, the distinction does not need to be made on the basis of a fixed percentage of costs. An alternative would be for the state to fully reimburse transportation costs, with some restrictions. Because so much of transportation costs are beyond district control, it may make sense for the state to reimburse districts for these expenses. In order to ensure equity, reimbursements could be made only for students being transported beyond a distance set by the state. Local districts could set different limits consistent with local preferences, but the state would only fund costs based on its policy. However, as noted this type of 100-percent reimbursement policy does not encourage districts to design efficient transportation systems and control costs. The Department of Education might want to consider employing a computer simulation package to assess district transportation costs to set standards for a reimbursement formula.

4. Capital Construction and Debt Service

States approach the funding of facilities in many different ways. According to the 1993-94 *Public School Finance Programs of the United States*, 13 states provide no capital outlay funding, though several of these states do provide some monies for debt service or offer low interest loans. Seven states provide capital outlay through their basic support program, and 30 states contribute some state funding for capital projects by means other than their basic support programs. Amounts, mechanisms, and percent of funding from the state varies hugely.

A more recent congressional Government Accounting Office (GAO, 1995) study reported that 40 states have ongoing assistance programs, ranging from $6 to $2,000 per student. Thirteen of these states have established comprehensive facilities programs. The GAO report found that overall most states do not play a major role in addressing facilities funding, and that state philosophy on the issue varies considerably. Many states report that school facilities are primarily a matter of local responsibility.

The comparison models tend not to include capital construction and debt service in their formulas, leaving this to separate state funding programs. The exception is Tennessee, which provides funding per the following specifications:

100 sq ft per total K-4 ADM x $55/sq ft
110 sq ft per total 5-8 ADM x $56/sq ft
130 sq ft per total 9-12 ADM x $56/sq ft
Add equipment (10% of sq ft cost)
Add architect's fee (5% of sq ft cost)
Add debt service (20 years @ 5.25%)
Divide total by 40 years = annual amount

The OQEM currently does not include costs for capital construction or debt service. As noted by the developers, implementing the OQEM may require substantial additional classroom space as districts lower class size to the levels suggested in the model. Capital costs are presently the responsibility of local districts, with the exception of possible facility grants from the state. Given that capital construction needs vary tremendously by district, it is appropriate for the OQEM to include only operational costs and leave facility funding outside the model. However, due to the additional space required to fully implement the OQEM and the high costs of capital construction, the state may want to consider categorical funding programs for facilities.

M. Adjustments

In many of the adequacy models, as well as in many school finance formulas, once a base level of funding per pupil has been determined it is common practice for states to adjust this figure based on a number of factors usually considered beyond the control of the school district. Some states provide adjustments for small schools and/or districts, based on the theory that these agencies face diseconomies of scale that necessitate additional funding. Many models adjust for inflation, and a small number also provide regional cost differences to account for the differences in the costs of service-provision that some districts face.

The OQEM Commission was not charged with examining ways to allocate funds to school districts, and as a result the OQEM does not incorporate distributional factors. The Commission notes that not all schools in Oregon resemble the prototypes, and that adjustments can be made to reflect an individual school's characteristics. Distribution of funds to school districts is closely linked to determination of funding needs, and we therefore recommend that the OQEM take these factors into account. Below we discuss a number of the distribution issues which might be considered in the final design of the OQEM.

Small Schools and Districts

There is ample evidence in the literature that small and remote schools generally are more expensive to operate on a per-pupil basis. This is intuitively obvious from looking at the fixed costs of a school. For example, a school with 300 students and a school with 600 students probably each have one principal, but calculated on a per-pupil basis the cost of the principal is twice as high in the smaller school. To compensate for the higher per-pupil costs and the diseconomies of scale faced by small schools and districts, some states include adjustments for small schools and districts in their funding formulas.

While it is obvious that small schools cost more per pupil regardless of their location, the actual cost implications of small schools tend to be very different for large districts than for small districts. The former enjoy offsetting economies. For example, larger districts tend to be able to allocate fractions of pupil support personnel, maintenance workers, and administrators to their small schools-- an option less frequently available to smaller districts. Similarly, larger districts often are able to obtain quantity discounts for purchased goods and services that may not be available to smaller districts. Most states that provide an adjustment for small schools do not extend those adjustments to larger districts. Oregon's small school adjustment is provided to small and remote schools, and while the formula is somewhat complex, essentially smaller schools receive a larger adjustment.

Based on comprehensive studies of current practices, MAP recommended that Wyoming provide sliding scale adjustments for small schools and small school districts based on enrollments. Also, utilities and student activities costs are fully reimbursed for small schools. In December of 1999 the Wyoming trial court found these adjustments unconstitutional. The state is appealing.

The Maine Committee discusses the potential need for an adjustment due to diseconomies of scale for small schools and small districts, and recommends a study of expenditure and resource allocation patterns in small schools and districts similar to the one Wyoming conducted (see MAP 1998d).

The OQEM does not include a provision for additional small school costs. However, if the current distribution formula is used, such an adjustment, in the form of an additional student weight, is included in that formula. It is important that these costs be included in the model, either through the distribution formula as in current practice, or through some adjustment in the model itself.

One way to determine what the adjustment for small schools should be is to construct a function that relates per-pupil costs to district and/or school size. The coefficients from this model can serve as estimates of the weight that should be applied to costs to accommodate smaller size. This adjustment can be treated as a continuous variable that declines as school or district size increases and ends at some cut-off point, or can be one or two simple weights applied to all costs in a school or district. Some states – notably Texas – have attempted to construct such a function. Other states let the adjustment become part of the political negotiations surrounding the appropriation of funds to school districts.

Inflation

Over time, the costs of providing an adequate education will change due to inflation and the state funding model should be adjusted accordingly. States have approached this problem in a variety of ways.

The Maine Committee acknowledges that cost adjustments will be required over time to reflect changing costs in personnel and services, but does not make a specific recommendation on how the adjustment should be calculated or applied. Wyoming does not require a particular schedule

for inflation adjustments, leaving it up to the discretion of the legislature. An automatic external cost adjustment was considered by the legislature and rejected. In the Tennessee model, unit costs are reevaluated annually based on actual expenditures, and are also inflation-adjusted annually.

Legislators should be aware that any form of mandatory automatic adjustment will have the effect of giving education funding priority over other fiscal considerations.

Regional Cost Adjustments

The cost of providing an education varies across districts in the same way that cost-of-living varies by city. Ideally, cost-based education funding systems should account for the different costs that districts face for providing the same level of services. Unfortunately it is very difficult to accurately determine and adjust for cost differences. States rarely have consumer price information at the district level, and researchers do not agree on the appropriate measure of such costs. Hence regional cost adjustments are relatively rare in education funding formula, despite the belief that they are theoretically important.

Regional cost adjustments have been a controversial issue in Wyoming. While there is general agreement that costs vary considerably across districts and that an adjustment is needed to accommodate these differences, there is little agreement on how the formula should be calculated or applied. The Wyoming Department of Finance computes a semi-annual index of consumer prices for each county, broken down by elements such as housing costs, medical costs, etc. The Wyoming consultants recommended that only particular subcomponents be used in constructing the regional cost index in order not to overcompensate for amenities. Earlier this year the Wyoming trial court found that while it is appropriate to compensate for differences in amenities, the specific methodology adopted by the legislature was unconstitutional. Another regional cost issue concerns the portion of expenditures that is subject to the adjustment. Wyoming applies the regional cost factor only to personnel costs (see MAP 1998e and 1997b).

In Tennessee, systems with above-average costs receive a "cost differential factor" for all positions. The factor is determined at the county-area level using average wage data from the Tennessee Department of Employment Security. The Maine Committee did not address regional cost differences.

In 1997 MAP was commissioned to conduct a feasibility study on a regional cost adjustment for Oregon districts by the Confederation of Oregon School Administrators. Readers are referred to this report for more information on how the issue relates to the OQEM (MAP, 1997).

ESTIMATES OF PER-PUPIL EXPENDITURES ACROSS MODELS

The major purpose of the adequacy models described in this chapter is to ascertain how much revenue is needed to provide an adequate education for the children in each state. Tables 3-10, 3-11 and 3-12 summarize the cost data that can be derived from the comparison models. Tennessee's model provides base funding only and is therefore not directly comparable, so it is not included in these tables.

Table 3-10 summarizes total per-pupil expenditures for personnel and non-personnel categories as estimated by the models in the four states. The OQEM produces the highest per-pupil expenditures at each school level. The Wyoming model numbers are generally most similar to the OQEM.

At the elementary level, the Oregon, Wyoming and Illinois models each generate per-pupil expenditures in the $6,000 range, while the calculation in Maine yields a lower figure of $4,829. Oregon's estimate of $6,301 per pupil is the highest among the four states.

At the middle school level, Oregon again provides the highest estimate of $6,288, with Wyoming close behind at $6,174. The Maine and Illinois calculations are both just over $5,000 per pupil.

At the high school level, the Oregon and Wyoming models call for slightly over $6,400 per pupil, while the Maine and Illinois estimates are in the $5,500 range.

Tables 3-11 and 3-12 provide a breakdown of per-pupil expenditures for non-personnel factors and offer a percentage breakdown for those figures. Non-personnel costs vary considerably as a portion of the total, ranging from a low of 18 percent in Illinois elementary schools to a high of 49 percent in Wyoming high schools.

Table 3-10
Comparison of Per-Pupil Expenditures Across Models

	Elementary			
Expenditure Category	**OR**	**ME**	**WY**	**IL**
Personnel				
Per-pupil expenditures	$4,445	$2,889	$3,604	$4,987
% of Total	71%	60%	58%	81%
Non-Personnel				
Per-pupil expenditures	$1,855	$1,940	$2,584	$1,180
% of Total	29%	40%	42%	19%
Elementary Total	$6,301	$4,829	$6,187	$6,167
	Middle School			
Personnel				
Per-pupil expenditures	$4,079	$3,041	$3,458	$3,956
% of Total	65%	61%	56%	77%
Non-Personnel				
Per-pupil expenditures	$2,209	$1,977	$2,718	$1,130
% of Total	35%	39%	44%	22%
Middle School Total	$6,288	$5,018	$6,174	$5,106
	High School			
Personnel				
Per-pupil expenditures	$4,204	$3,153	$3,268	$4,156
% of Total	65%	57%	51%	77%
Non-Personnel				
Per-pupil expenditures	$2,273	$2,363	$3,138	$1,230
% of Total	35%	43%	49%	23%
High School Total	$6,476	$5,516	$6,405	$5,393

Table 3-11
Comparison of Non-Personnel Expenditures Across Models
Dollars Per Pupil

	Elementary				Middle School				High Scho		
	OR	**ME**	**WY**	**IL**	**OR**	**ME**	**WY**	**IL**	**OR**	**ME**	**W**
Total Supp, Equip & Tech	$285	[a]$285	$372	$318	$283	[a]$285	$365	318	$352	[a]$430	$
Supplies	$220	$285	$228		$235	$285	$215		$300	$430	$
Equipment			$144				$150				$
Technology	$65				$48				$52		
Student Activities		$25	$14		$157	$25	$91		$219	$58	$
Professional Development	$160	$70	$92		$139	$70	$92		$135	$70	$
Extended Instruction	$45				$140				$142		
Assessment		$100	$25			$100	$25			$100	
Vocational Education		$108				$108				$108	
Food Service									$12		
Special Education	$360		$571		$459		$571		$366		$
LEP											
EDY											
GATE		$34	$9			$34	$9			$34	
Central Administration	$303	$225	$554		$303	$225	$554		$303	$270	$
Maintenance & Op	$461	$625	$616		$461	$625	$680		$461	$825	$
Transportation	$241	$293	$331		$231	$330	$331		$231	$293	$
Other		[b]$175				[b]$175				[b]$175	
Total Non-Personnel	$1,855	$1,940	$2,584	$1,180	$2,209	$1,977	$2,718	$1,130	$2,273	$2,363	$3

[a] Does not include computer hardware; the Maine Commission recommends that this be funded separately through categorical grants.
[b] Covers the costs of technical support personnel and on-going technology training for teachers.

Table 3-12
Comparison of Non-Personnel Expenditures Across Models
Percent of Total

	Elementary				Middle School				High Sch		
	OR	**ME**	**WY**	**IL**	**OR**	**ME**	**WY**	**IL**	**OR**	**ME**	**W**
Total Supp, Equip & Tech	4.5%	5.9%	6.0%	5.2%	4.5%	5.7%	5.9%	6.2%	5.4%	7.8%	
Supplies	3.5%	5.9%	3.7%		3.7%	5.7%	3.5%		4.6%	7.8%	
Equipment			2.3%				2.4%				
Technology	1.0%				0.8%				0.8%		
Student Activities		0.5%	0.2%		2.5%	0.5%	1.5%		3.4%	1.1%	
Professional Development	2.5%	1.4%	1.5%		2.2%	1.4%	1.5%		2.1%	1.3%	
Extended Instruction	0.7%				2.2%				2.2%		
Assessment		2.1%	0.4%			2.0%	0.4%			1.8%	
Vocational Education		2.2%				2.2%				2.0%	
Food Service									0.2%		
Special Education	5.7%		9.2%		7.3%		9.2%		5.7%		
LEP											
EDY											
GATE		0.7%	0.1%			0.7%	0.1%			0.6%	
Central Administration	4.8%	4.7%	9.0%		4.8%	4.5%	9.0%		4.7%	4.9%	
Maintenance & Op.	7.3%	12.9%	10.0%		7.3%	12.5%	11.0%		7.1%	15.0%	1
Transportation	3.8%	6.1%	5.3%		3.7%	6.6%	5.4%		3.6%	5.3%	
Other		3.6%		14.0%		3.5%		15.9%		3.2%	
Non-Personnel % of Total	29%	40%	42%	19%	35%	39%	44%	22%	35%	43%	
Personnel % of Total	71%	60%	58%	81%	65%	61%	56%	77%	65%	57%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	1

COST SOURCE CONSIDERATIONS

The OQEM seeks to determine the cost of a quality education. The model is composed of quantities of certain inputs-- teachers, supplies, etc.-- at certain prices, which are assumed to reflect the real costs of those inputs. If they are to adequately establish cost, the inputs have to be appropriate in nature and quantity to produce the desired educational outcomes, and the imputed prices have to at least equal the real economic costs of those inputs (assuming a specified level of quality).

Our analysis finds that the nature and quantity of inputs in the OQEM is generally consistent with other models and the national literature. The fact that disparate, knowledgeable groups working independently arrived at such similar conclusions tends to enhance our confidence in the OQEM results.

Determination of appropriate prices for inputs requires further analysis, however. Although markets rarely operate perfectly in the short run, under conditions where there are several sellers competing to sell to many buyers, it is reasonable to assume that the average prices paid are equal to the real cost of a product. But where entry into the market is limited in some way, it is important to consider the extent to which prices paid reflect the true cost of an item. For example, since there are a fixed number of school districts, and since teachers are frequently, if not always, represented by one of two major organizations, it is important to consider the extent to which teacher salaries reflect the market price for individuals with the skills and knowledge requisite for a teacher.

The OQEM prices are all based on statewide average expenditures. For those inputs acquired in competitive markets, such as textbooks, vehicles, and classified employees, the price paid by districts should equal the actual costs of those inputs. In those cases, statewide averages are a good surrogate for actual costs. But average expenditures may not accurately capture the costs of professional salaries, the largest single input of the OQEM. As MAP pointed out in a March 1997 report commissioned by the Confederation of Oregon School Administrators (COSA), current salaries may be higher or lower than their true economic cost.

If the market for education services were fully competitive (if, in other words, it were a pure market), “cost” and “expenditure” would generally be identical. If there were many school districts in any region competing for the labor of many college graduates, a school district that paid salaries below the economic cost of teachers would find that its teachers were being bid away by other school districts that paid the full cost. Teachers who demanded compensation in excess of the full economic cost of providing their labor would find themselves unable to find employment, because equally qualified teachers would take the available jobs at a lower price.

The market for education services is not fully competitive, however. In many communities, a school district is the dominant purchaser of college-educated labor. It need not be the sole purchaser in order to have a market-distorting effect; rather, it need only be a major purchaser to prevent the market from functioning with perfect competition.) And because teachers tend to be more highly unionized than other college-educated workers, teacher unions have similar control

over the supply of teacher labor. That boards of education are publicly elected may also inhibit the market from operating in a pure competitive form, because school employees may have dual roles, being both employers (as electors and taxpayers) and employees.

The Commission should consider the appropriateness of relying on the actual (or estimated) expenditures of school districts to determine the costs of all inputs. To date these estimates have been based on expenditure estimates from various sources such as OSBA, COSA and the DBI. For some components, such as teacher costs, the state may want to develop alternative market-based estimates of costs.

Chapter 4. Analysis of OQEM Issues

Chapters 2 and 3 of this report examined the design of the OQEM and how it compares to similar models in other states. In this chapter, we focus on issues that require consideration by the OQEM Commission before the OQEM is implemented. Our discussion is divided into three sections:

- Implementation issues (distribution and governance);
- Links to student outcomes; and
- Intangible factors.

IMPLEMENTATION ISSUES

This section considers the broad questions of implementation and governance. Rather than focus on the individual cost components, this section considers how the OQEM can be used to support the distribution of resources to districts, and considers governance issues associated with that distribution.

Distribution of Funds to School Districts

As envisioned, the OQEM provides a way to estimate how much it should cost to provide an adequate education to Oregon's children. Assuming that the model accurately estimates costs, the next question is how funds should be distributed to districts.[27]

Oregon currently uses a foundation program to fund its 198 school districts. A target grant (foundation level) is established statutorily and adjusted for each district on the basis of teacher seniority. This grant is then multiplied by the weighted average daily membership of each district (ADMw) to determine the district's revenue. In simplified form, local property tax collections are subtracted from this total, and the state pays the difference. Student weights are calculated for special education, ESL, pregnant students and students with children, students in poverty, students in foster homes and neglected and delinquent children. Kindergarten students are weighted at 0.5. In the eight elementary districts students are counted as 0.9 and in the 12 high school districts they count as 1.2. There is a weight for students in remote small schools which varies by grade level, size, and remoteness of the school location.

In revising the current funding system to incorporate the funding figures generated by the OQEM, the state has two options. One approach would be to continue to distribute funding through the existing foundation formula, but at the level determined by the OQEM and with substantial modifications to the weighting system. The second approach would be to replace the current formula with a cost-based model. Each of these strategies is discussed in turn below.

[27] We assume that distribution of funds from districts to school sites is a district responsibility, and do not include a discussion of that issue in this report.

Strategy 1: Modify the Foundation Formula

Modifying the current foundation formula is a viable but complex option. The OQEM is designed to address the question of total education costs, so it possible to replace the current $4,800 per-pupil target grant with a new figure representative of OQEM-estimated costs. However, the OQEM estimates cannot be inserted into the existing formula without substantially modifying the current system of weights. The weighting system would need to be aligned with the assumptions made in the OQEM—a difficult task that will result in a much more complicated formula than currently exists. To understand why this is the case, we must consider the purpose of the weighting system.

Recall that the OQEM establishes a per-pupil cost based on the assumptions used to create the prototypes. Clearly, the student population and other characteristics in many schools across the state differ from the prototype assumptions. The OQEM was constructed to reflect the educational inputs necessary to adequately educate the assumed student body and school characteristics. If the conditions (i.e., the characteristics of the students, teachers, or schools) change, then the costs at that school would also be expected to change.

Since the characteristics of students vary across districts, it would be inappropriate to simply allocate the OQEM-generated per-pupil revenues to each district. A distribution system is needed to target funding appropriately. It is not necessarily "equitable" to distribute the same nominal dollars per pupil to each school district in the state, for three reasons: 1) districts may have different needs for dollars because the characteristics of children, and thus the difficulty of educating them, may vary from place to place; 2) districts may have different needs for dollars because structural factors beyond district control (e.g., economies or diseconomies of scale resulting from population density) may vary from place to place; and 3) nominally similar dollar amounts may purchase different qualities and/or quantities of certain inputs such as school facilities, utilities, or teachers in different districts, because of regional cost differences.

The current Oregon funding formula attempts to take into account these factors through its weighting system. The current target amount is a foundation grant, representing the base level of per-pupil funding. All students receive this base amount, adjusted upwards for students with additional needs. There are only two cases where students are thought to need less than the base amount: kindergarten students, who are weighted 0.5 because they only attend school half the day; and elementary district students, who receive 90 percent of the base level funding, apparently because the formula developers determined that educating elementary-level students requires less resources than educating older pupils. Note that in each of the cases where the foundation amount is adjusted downwards, the weighting is applied equally to all the students in the category. In other words, all the elementary-district students are weighted 0.9.

In contrast, the OQEM figures do not represent a base amount of funding. Rather, they estimate "typical" student costs. The OQEM makes assumptions about the number of students with special needs in each prototype school, and provides staff to meet the needs of those students. If a district has fewer special needs students than the prototype, it is appropriate to adjust per-pupil funding downward for that district, whereas if a district has a greater population of special needs

students its per-pupil funding level would need to be increased to maintain adequacy. Because the OQEM funding levels would need to be adjusted both upward and downward for multiple categories, it would be impossible to retain the flat weighting system currently in the formula. Instead, multiple layers of weights would need to be specified.

For example, consider special education students. The OQEM assumes that approximately 12 percent of students in the prototype schools receive special education services. Therefore, special education students in schools that matched this figure would receive a weight of 1.0 (the prototype amount of funding). Special education students in schools with special education populations substantially below the 12 percent level would receive a weighting under 1.0, to reflect reduced costs. Those in schools with substantially more special education students would receive a weighting over 1.0. Exact ranges and weights would have to be determined for each weighting category. The difficulty of this task should not be underestimated.

Another possible means of distributing additional funding to special needs students would be through categorical grants. This approach could circumvent the need for many of the weighting categories. Policy makers would have to determine appropriate grant levels and an allocation system. The state could either allow districts to utilize the funding as they choose, or mandate that it must be used to serve the populations generating the additional revenue. While the second approach is typical of most categorical programs and targets funding specifically to at-risk populations, it also results in a greater administrative burden and less local control over spending decisions. As a result, the goal of local control and local decision-making suffer and the state will appear more and more in charge of spending decisions, and thus less able to hold districts accountable for outcomes.

An alternative to designing a complex system of weights or categorical programs would be to revise the OQEM so that it estimates a foundation level of funding. Doing so would involve adjusting the assumptions around which the model was built (for instance, assuming there were a minimal number of special education students rather than 12 percent), and modifying the program and staffing levels accordingly. The OQEM could then be used to generate an adequate level of base funding, to which the current weighting system could be applied with only minor alignments.[28] One consequence of this approach is that the OQEM would no longer be able to estimate total costs to the state independent of the distribution system.

Another issue for policy makers to consider is that while a foundation program with a system of pupil weights would probably accommodate student needs like special education, compensatory education, and education for English language learners, it is less likely that such a system would work well for transportation funding, small school adjustments or for regional cost differences (see the discussion in Chapter 3 regarding distribution issues for these topics). While pupil weights could be imputed for these programs, the cost and resulting complexity associated with developing and implementing such pupil weights may exceed the value of any improvement in precision.

[28] For instance, the school level weights would need to be revised since OQEM elementary-pupil funding is no longer a fraction of middle school funding levels.

In summary, a foundation program could be used to provide school districts with the resource level identified as adequate by the OQEM. However, since few schools are exactly like the prototype schools, it would be necessary to establish a system of adjustments to meet actual student needs. This could accomplished through complex pupil weighting systems, categorical grants, or a combination of the two. The important issue is how well the adjustments in the system approximate the real differences in cost experienced by districts across the state.

Strategy 2: Replace the Current Formula With a Cost–Based Model

A cost-based model is an alternative approach that addresses many of the problems associated with foundation programs. As an example, the Wyoming system uses an adequacy model similar to the OQEM to determine a core level of per-pupil funding, which is then adjusted upwards or downwards for each district based on a system of student weights or flat grants (for at-risk and LEP students), categorical/reimbursement programs (for special education and transportation) and a series of adjustments for factors outside district control (such as small schools and regional cost differences). The flexibility of this approach allows the state to allocate funding to districts based on the actual costs of individual districts, in so far as is possible.

The OQEM is well-suited to form the basis for a cost-based funding system. To implement such a system, the model would need to be expanded to show how varying the background assumptions would affect the resource levels in the model. For instance, if 80 percent of students in the prototype school were from low-income families, how would that change the level of resources necessary to provide a high-quality education? Designers would need to determine which components of the model would be expected to vary by student or district characteristics, and then decide how to accommodate actual district costs for each of these areas. This could be done through a combination of pupil weighting, direct reimbursement programs, and adjustments, as in the Wyoming model, or through specifying a more detailed model that included an analysis of how resource levels should vary by characteristic.

To date, Oregon has relied on data collected by OSBA, COSA, the Oregon School Employees and the DBI to estimate costs. However, that has been for the purpose of determining how much money is needed to fund the entire system, not to ascertain each individual district's allocation of those resources. This is where the distinction between costs and expenditures, described earlier in this report, comes into play most strongly. A cost-based distribution system needs to provide districts with funds based on the average costs of each component of the program, not on that district's actual expenditures. If the system relies on the actual expenditures of districts, it simply becomes a reimbursement system with no incentives for districts to control costs. If the system is based on the estimated "economic costs" of the components of the model, then districts will receive funds deemed to be adequate, but will need to determine how best to use those funds in their individual situations. As described in Chapter 3, in many instances the best estimate of market price is current school district expenditures. In other cases, alternatives exist and should be considered. If a cost-based system is implemented, it makes sense to use average expenditures when first developing the system (except perhaps for teacher salaries), but subsequent updates should be based on measures that are outside the control of district decision makers, whenever possible.

Depending on how many adjustments are made to the base amount generated by a district, the complexity of the model grows. Thus, policy makers need to be attentive to the competing issues of complexity and comprehensiveness. A reasonable compromise may be difficult to achieve.

It should be noted that, if properly implemented, both a student weighting system and a cost-based system like that described above should lead to the same revenue levels for individual school districts. What is important is specifying the cost differences accurately. The issues that the state should consider in making adjustments for cost differences include the following:

- Teacher education[29]
- Teacher experience
- Students with disabilities requiring special education
- Students from low-income households
- Students who are English language learners
- School size
- Transportation needs of a school due to differences population density and geographic characteristics
- Regional cost differences

The Role of Federal Funding

An additional issue the state must consider as it develops a funding distribution system is the role of federal funding. Federal funding is generally allocated to districts in the form of categorical grants associated with special needs students. How this money is utilized is strictly regulated by the federal government. The state must decide whether or not to consider the amount of federal funding a district receives in the state funding system. Theoretically, since the OQEM determines the total amount of funding necessary for each district to provide a high-quality education, the state could subtract the amount of federal revenue received by a district from the state's share of that district's allocation. This approach may prove difficult from an administrative standpoint, but may perhaps result in a more equitable allocation of funding and increased savings for the state. To assess the issue of federal funding further, the state would need to analyze the financial and administrative impact of both approaches.

The Local Levy Option

Another distribution issue that needs to be resolved is the local levy option. Under Oregon law, school districts are allowed temporary local levies to provide funding beyond what they receive through the state funding formula. These levies would still be possible under any of the scenarios described above. However, such local discretion would place some districts at a disadvantage if they were unable to raise these funds. While this is an important equity consideration, it would

[29] Setting teachers' salaries based on experience and academic units is a tradition observed in virtually all school districts, without any evidence that it is efficient or effective. Alternative payment systems could be considered that would minimize or obviate the need for these adjustments. For example, Wyoming does not adjust for differences in teacher educational attainment.

appear, based on the two school finance rulings of the Oregon Supreme Court,[30] that continuation of the levies would be constitutionally acceptable.

The outcome of this decision is unusually important. There is a large trade-off here between efficiency, liberty, and equity. To prohibit local district revenue add-ons is to decrease local control and oversight of the education system. It also may reduce citizen engagement with the system because of an inability to tailor education services sufficiently to local client preferences. On the other hand, these efficiency and liberty values must be weighed against the inequities in per-pupil spending that may result from permitting local districts to spend more than the OQEM estimates specify.

A compromise that has been achieved in other settings is to permit local districts the discretion to raise above-foundation revenues, but to use a guaranteed yield or power-equalizing mechanism. In such an instance, low property-wealth districts are not disadvantaged relative to high-wealth districts. However, unless there is a revenue recapture provision (always politically unpopular with revenue-exporting districts) from the wealthiest districts capable of transfer payments to the low-wealth districts, such a power-equalizing add-on provision portends added costs to the state treasury.

Transition to a New Formula

Assuming some changes to the funding formula are needed to use the OQEM as the determinant of an adequate level of funding, how the changes are implemented is also an important concern.

Although Oregon has made considerable progress in equalizing revenues across districts, some differences do exist. Today, some districts spend more than the OQEM allocates for a school, while others spend less. This may be, at least in part, a function of different costs and may disappear when adjustments for district, student, teachers' characteristics and regional cost differences are applied. To the extent that differences are not cost-based, forcing all districts to live within the means of the OQEM calculation will cause some districts pain, and give others increased resources. There are a number of school finance tools that can be used to help districts in these circumstances.

For the most part, districts that receive increases in funding will find ways to utilize the funds. The critical issue here is holding the schools accountable for results once the new funds are in place.

For schools that would suffer reductions in revenue, the state could implement a hold-harmless provision that would keep revenues at the present level. This protects the high-spending districts, but adds costs to the system if other districts are brought up to the new level immediately. One solution to this problem is to increase revenues slowly for the low-spending districts and use the difference between their revenue level and the OQEM estimate to fund high-spending districts.

[30] *Olsen v. State of Oregon* (2776 Or 9, 554, p2d 139) in 1976 and *Coalition for Equitable School Funding v. State of Oregon* (311 Or 300.811 P2d 116) in 1991.

Over time, as the overall level of spending catches up with the high-spending districts, more funds could be directed to improve spending levels in the districts that are low-spending today.

No matter how the transition is managed, there will be new and different inequities. The key is to develop a system that, once fully implemented, is as equitable as possible, and then move toward that system as rapidly as possible.

Governance

As designed, the OQEM is supposed to help policy makers ascertain the level of resources needed to provide an adequate education to Oregon's school children. As we understand it, the model is to be used to estimate the total costs, not to be prescriptive in terms of educational inputs. In other words, the prototype schools in the OQEM represent one way that a school should be able to meet the state standard for passing the assessment exams. It is not the only approach. Alternative methods are acceptable, but must be designed so that they do not cost more than the resources available as determined through the OQEM. Ideally schools will be held accountable for results, not how the funds are spent.

There is a risk that some districts choosing different spending patterns may not meet the state standards, and even districts that implement the prototype programs exactly may also fail to produce the desired outcomes. As they evaluate student outcomes, it is important that Oregon policy makers keep in mind that the OQEM is a funding model, not a program model. If the state requires all districts not meeting state standards to allocate resources exactly as designed in the OQEM, local control will suffer and there is no guarantee student performance will improve. State prescription and district accountability are incompatible. Once a state prescribes operational programs it becomes accountable for the educational outcomes produced.

LINKS TO STUDENT OUTCOMES

Implied in the development of the OQEM is that it will specify adequate resources for 90 percent of the state's students to meet the state assessment targets. There is, however no guarantee this will happen. As described in Appendix C, the relationship between spending and student performance is not entirely clear. While it makes intuitive sense that spending is linked to student outcomes, researchers continue to disagree on this fundamental point. Even when they agree there is an impact, they have not been able to determine what that impact is with precision. Moreover, while certain practices have been *associated* with improved outcomes, there is little evidence that they *cause* improved outcomes.

Many different factors will impact how well the students in a school or district perform. For example, consider teacher motivation. Teachers with the same levels of education and experience will receive the same salary in a given school district. Yet one teacher may be more highly motivated than her peers, working harder and perhaps more effectively. One might expect students in the more motivated teacher's classes to learn more and do better on state assessments. Yet the funding model envisioned under OQEM does not account for such differences in teacher motivation, nor is it likely that differences in motivation could be objectively measured.

Accommodating such hard-to-measure differences like teacher motivation is difficult to virtually impossible in school funding formulas. Until we find ways to reliably and validly measure teacher performance, it is unlikely that the costs associated with differences in teacher quality will adequately be addressed in any school finance model.

In short, at the present time, we do not know enough about how money and resources matter to be positive that any specific level of money or combination of resources will guarantee a given level of student performance.

INTANGIBLE FACTORS

In a paper prepared for the Commission, David Conley has begun a discussion of intangible factors as they relate to student performance. As defined in Conley's memo, "intangibles" are those factors that research suggests are associated with improved student outcomes, but cannot be easily measured or related directly to tangible costs.

In addition to teacher quality (discussed above), these intangibles include such variables and processes as leadership, orderly learning environments, and aligned curriculum and assessment. Rather than try to rank these by importance, and recognizing that there may be interaction effects among them, Conley has grouped them into three categories: those with a critical effect; those with an important effect; and those with an augmenting effect on student performance.

As Conley points out, absent substantially better data collection, it is not possible to measure these intangible elements, nor estimate what they might cost. It may never be possible to accurately determine the costs for some of these elements. Conley does suggest that it is possible to ascertain, over time, the costs of the data systems needed to measure these intangibles, and it is possible to measure the costs of such things as professional development necessary to carry out effective learning programs, and the costs of recruitment for high-quality faculty. Teacher preparation costs can also be estimated, as can the cost of having student re-take classes that they fail the first time.

We suggest that the data collection efforts proposed to deal with these intangibles have additional difficulties as well. While measurement systems may be able to ascertain the existence of, and possibly even the level of, a factor like parent involvement, it is much harder, if not impossible to measure the value added by that involvement. While research suggests that parent involvement is important to student achievement, this assumes that the parents are engaged in working with their children at home, volunteering in the classroom or participating in the school's governance, and that those experiences are positive for both the children and the school. In some cases, parents may become too involved, arguing unduly with the educational decisions made by the school officials and preventing them from devoting adequate time to student learning. In such cases, "parent involvement" may have a negative impact on school climate and perhaps on student achievement. A system that measures the existence of parent involvement based on time parents spend in school is unlikely, by itself, to be sufficiently sensitive to capture these differences in parental actions.

Another example is the measure of teacher efficacy. Assuming a measure can be developed for this variable, will it be able to measure the cause of differences in teacher efficacy? For example, are measured differences the result of differences in skill and knowledge (even for teachers with the same experience and education)? Or are they the result of different motivation on the part of teachers, or perhaps the interaction with gifted administrative leadership? It seems that the way to improve a teacher's efficacy would be dependent on the context. Absent measures sensitive enough to detect these differences, the data collection efforts envisioned may still be inadequate to deal with these intangible issues. Moreover, the cost of such data collection may be considerable. Of particular concern is the potential data-gathering burden on local educators. Data collection imposed by well-intentioned policy makers frequently serves to detract time from instruction.

As data systems improve, it may be possible to get a better handle on the intangible costs of providing a quality education for all children. As these estimates are made, the state could move to include them in the OQEM as appropriate. However, the state should be cognizant of the costs of such data collection efforts. Measures of many of the intangible factors in Conley's memo are imprecise and subject to considerable subjective interpretation. Spending large sums of money and devoting considerable efforts on the part of state and district staff to collect these data may not be an efficient way to improve student performance. We recommend that before large-scale data collection efforts are undertaken pilot studies be attempted first. Where successful, the state can consider full implementation. However, the quality of the data, and the way they will be used, should be carefully analyzed before making a decision to include it in the OQEM or its associated funding formula.

Chapter 5. Conclusions

Oregon is one of a handful of states using or considering a professional judgment approach to fund an adequate educational program for its K-12 public school students. The OQEM represents an excellent effort to identify and cost out the essential elements of an adequate education. The challenge facing the state today is implementing this model in a fair and efficient way, and determining how to hold schools accountable for results.

Although the OQEM may accurately determine the level of funding necessary to provide an adequate education, the model cannot guarantee that schools will achieve the desired results, even if they implement the parameters exactly as specified. Links between funding and achievement are not sufficiently understood at this time to achieve such an outcome. Increasing the level of funding will not automatically lead to higher student achievement. Moreover, the state should avoid the temptation to mandate how inputs are used. We recommend above that the OQEM be used to ascertain how much is needed to offer an adequate education, but that local districts be free to use the resources as they think best. A professional judgment model like the OQEM is best at determining the level of resources needed, not at specifying how each and every child should be treated, nor what inputs a district should purchase with those resources.

How funds are distributed to districts and schools is another important issue in determining adequacy. Even if the total state education budget is adequate, funds must be targeted such that districts have sufficient revenue to provide an adequate education to their particular student population. The OQEM was developed without regard to distribution issues, but for funding to be adequate at the district level, policy makers must now turn their attention to these factors. Distribution is an important part of an adequacy model and must be considered before total funding levels can be determined.

Oregon’s court rulings, combined with voter approval of Measures 5 and 50, have led to the establishment of a highly equitable funding system. The OQEM is a powerful tool that can be used to estimate how much Oregon’s citizens should spend to meet the goals they themselves establish for the performance of the state’s children.

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Appendix A: Education Reform in New Zealand

At the January 20, 2000 meeting of the Oregon Quality Education Model Task Force, MAP was asked to research the approach taken by New Zealand to fund its schools. This paper summarizes our findings, focusing on the formula distribution of resources to schools in New Zealand.

New Zealand's school system was decentralized to a large extent during the 1990s as a result of the passage of the Education Act of 1989. This act was the direct result of a government task force report titled *Administering for Excellence: Effective Administration in Education*. The task force identified five criticisms of the education system at that time:

- Excessive centralization of decision-making
- Complexity with "too many decision points"
- Lack of information and choice
- Lack of effective management practices
- Feelings of powerlessness

The effect of the resulting reforms was, in part, to direct resources directly to local school boards without the involvement of intermediary or regional agencies. The goal was to place decision-making where it was thought to have the greatest impact.

One outcome of this decentralization of authority over New Zealand's schools was the development of a formula based funding system for schools. The initial intention of the reforms was to grant schools lump sum budgets for the purchase of required inputs. To date this has been partially successful. Funds for school operations are distributed largely in this fashion, but for most schools, payments of teachers' salaries are still centralized.

Teachers' pay is the largest share of most school expenditures. New Zealand has developed two approaches for providing central support to schools for paying teachers. One is Centrally Resourced Schools where teacher salaries are paid directly by the central government. This model is still used by some 89 percent of the schools across the country. The second option is to be a Directly Resourced School. Under this option, first implemented in 1996, a school receives the resources for its teachers and then hires as it sees fit.

The principle difference between the two approaches is that under centrally resourced schools, the Ministry of Education pays the teachers at a school regardless of variations in salaries due to variables such as experience and education. In Directly Resourced Schools, funds are sent to the school for the employment of teachers. The amount is based on the number of teachers to which the school is entitled and the nation-wide average teacher salary. Schools with relatively low salaried teachers can take advantage of this and employ more teachers in the short run. For schools with relatively high salaried teachers the incentive is to stay in the centrally provided pool.

Funding for all functions other than teachers and senior managers is not earmarked for any specific purpose, and is composed of four components:

- Basic student allocation
- Curriculum enhancement
- Student supplementary educational needs
- School site needs.

Basic Student Allocation

Core Staffing for a school includes teachers and management. Schools receive a teacher allotment based on enrollment. The allotment is based on the pupil/teacher ratios displayed in Table 1.

Table 1 Staffing Levels In New Zealand Schools

Year of Schooling	Teacher/Student Ratio
1-3	1:23
4-6	1:29
7-8	1:29
9-10	1:25
11	1:23
12	1:18
13	1:17

School managers are allocated on the basis of enrollment. Management time is funded using a complex formula that recognizes the demands of educational delivery to students at different levels and also provides greater increases in time per pupil enrolled for schools with up to 200 students and then gradually levels out. Thus, larger schools generate more money to hire managers, but at a decelerating rate as school size increases.

Operational funding is generally driven by student enrollments and funds are provided at different rates depending on the grade of students. Using years 1-6 as the base, funding increases to 1.15 of the amount in the first six years of school for year 7-8; 1.34 I years 9-10 and 1.49 in year 12.

Relief teacher funding is also provided for "relief" teachers based on a formula that addresses number of teachers and absence rates, but also has some centrally controlled teachers to provide relief for long term absences by teachers.

Curriculum Enhancement

Schools receive additional funding for the following programs and needs.

1. Technology curriculum in years 7 and 8. This includes additional staff to operate centers that support delivery of technology programs. It appears that the goal is to

take advantage of economies of scale across numbers of small schools to manage the equipment and staffing needs of technology.

2. Transition education programs for school to work programs provided on a per-pupil basis.

3. Maori language provision that grants additional teaching positions to schools with higher numbers of Maori language speakers, and is subject to specific requests made by a school's Maori community.

4. Additional funding is provided for special schools.

Student supplementary educational needs

Three areas of additional student need are targeted in the distribution of funds to schools.

1. **Socio-economic status**. The supplement ranges from 0 to 63 percent of total funding depending on the number of students with the following characteristics:

    a. Households in lowest income category
    b. Average number of persons per bedroom
    c. Parents not completed primary school
    d. Parents on welfare benefits
    e. Parents in manual occupations
    f. Enrollment of Maori/Pacific Islanders
    g. Parents unemployed

2. **Special education**. A program called the Ongoing Resourcing Scheme provides additional resources to meet the specific needs of children with disabilities.

3. **Career guidance**. Extra resources are allocated to the highest grades in secondary schools to provide career guidance to students.

School Site Needs

1. School site. Additional funding is provided to schools with fewer than 160 students. The purpose of this funding is to insure that maximum average class size in grades 1-8 is no more than 28 to 1. A small school adjustment is also made for very small schools.

2. School Location. Funds are targeted to isolated rural schools.

3. Site running costs. Supplements are paid to schools based on the costs of utility services, maintenance and minor capital costs

Student Outcomes

The New Zealand reforms were essentially managerial and structural in nature, although like any other state or nation attempting to reform its education system, improvements in student performance were the core reason for changes. Because New Zealand does not have a nationwide standardized student assessment system, it is difficult to empirically assess the impact of the reforms on student performance. At present, researchers (Fiske & Ladd, 2000) studying the New Zealand reforms have identified a number of activities implemented by districts which outside research has suggested should lead to improved students outcomes. However, to-date no empirical data exist to confirm this in New Zealand. A longitudinal study analyzing parent, teacher, and principal opinion has found that many principals report a positive impact on learning and teaching; that relations between principals, teachers, and parents have improved; that the majority of parents are happy with the quality of their children's' schools; and that over time teachers have come to have an increasingly positive view of the reforms (Wylie, 1997). The surveys also identified several areas of concern: three-quarters of principals think government funding levels are inadequate; teacher turnover and job dissatisfaction has increased due to increased workloads; and the poorest schools report that the reforms have had little impact on improving resources or student learning.

Appendix B: The Effect of Class Size on Student Achievement

Setting a class size is one of the most important decisions in a school funding model because it has such a profound impact on the total education budget and on the day-to-day lives of students and teachers. What is the "right" class size? Will reducing class size lead to greater student achievement? Is setting a low class size a good use of resources? Unfortunately, there are not yet definitive answers to these questions. Though class size reduction is one of the most popular school reforms today, its efficacy and cost-effectiveness is highly controversial among researchers. This paper explores the issues surrounding class size, summarizing the policies in other states and discussing the research linking class size to student achievement and cost-effective reform.

State Policies and National Trends

Reducing class size, particularly in the primary (K-3) grades, is perhaps the hottest state educational policy initiative in the nation today. In March 1997, a *Wall Street Journal* poll found that 70 percent of adults believe reducing class size would lead to big improvements for public schools. A 1997 *Education Week* survey found that 83 percent of teachers and 60 percent of principals believed classes should not exceed 17 students (Bell, 1998). Parents say their children are happier and learn more in smaller classes. Teachers report they have fewer discipline problems, are able to give students more individual help and can cover material faster.

Reducing class sizes to improve education is not a new idea. Data from the Federal Government show that the average pupil-teacher ratio in the United States has declined dramatically in the last forty years, from nearly 27:1 in 1955 to approximately 17:1 in 1997 (NCES, 1997). Some of this reduction can be accounted for by the increased availability of special programs for children which utilize very small classes or rely on "pull-out" programs that require a teacher to work with children individually or in small groups (i.e. special education and Title I). However, there have been real declines in the average number of children in most classrooms across the United States. One reason for this is that when increased resources become available schools have historically chosen to put them into teachers. Nationally, as per-pupil spending increases, pupil-teacher ratios have declined. Research by Barro (1992) found that on average, when a school district received an additional dollar of revenue, half of that dollar was spent on teachers. Of that 50 cents, 40 cents was spent on reducing class size and 10 cents on increasing salaries. Barro's findings help confirm the apparent priority educators place on smaller classes, and their willingness to trade increases in salary for smaller classes.

In recent years, a number of states have passed legislation either mandating smaller classes in elementary grades, or establishing incentive programs to finance smaller classes. Table 1 provides a summary of current class size reduction programs across the states. The table identifies 19 states that have some form of class size reduction. Ten of the states rely on incentives to encourage school districts to reduce class size, while eight use mandates. Most states that implement class size reduction seem to set average K-3 class size at around 20 students. Nevada has the lowest mandated size, requiring no more than 15 students per class. At

the other end of the range, North Carolina has an incentive program for schools to keep K-2 classes down to 23 students. The focus of these programs is almost entirely on the primary grades, generally K-3. North Carolina's program is the most limited, covering only grades K-2, while Oklahoma's program encompasses the greatest range at K-6. California has recently begun to offer incentives for class size reduction in the ninth grade, but so far this extension is the exception rather than the rule.

Costs

Small classes are expensive, perhaps the most expensive of all reform interventions. California's program provides an additional $800 per student for children in K-3 classrooms with 20 or fewer students. It also provides funds for school and classroom construction. To reduce the class size from an average of approximately 29 to 20 or fewer students, the first year costs of the program were some $1.1 billion. By the end of the program's third year (1998-99), the state will have spent more than $4 billion on class size reduction. This observation is in line with general estimations offered by Brewer, Krop, Gill, and Reichardt (1999).

Other states have made similar investments. Tennessee spent about $600 million between 1991 and 1996 to implement its program. In Philadelphia, Superintendent David Hornbeck has unveiled plans to reduce class size in kindergarten through third grade from an average of 27 students to 20 students by the year 2002. He estimates that the program will require 1,000 new teachers at a cost of $50 million a year, as well as 35 new schools at a construction cost of $470 million.

Class size reduction efforts become progressively more expensive as the number of students per class decreases. For example, a hypothetical district with 10,000 students would need to add about 22 teachers (and classroom space) to move from 22 to 21 students per teacher (a 4.5% reduction). However, it would take about 42 more teachers to move from 16 to 15 students per teacher (a 6.3% reduction). Figure 1 shows the number of additional teachers needed to reduce class size to progressively lower levels.

Effectiveness

The general belief of most educators and policy makers is that smaller classes are effective in improving student performance. Even those who are not convinced there is a strong supporting research base are willing to concede that smaller classes can lead to more individualized instruction, higher morale among teachers, and more opportunities for teachers to implement instructional programs that research shows work well. However, it is difficult to ascertain the "right" class size and if the effects of being in a small class in grades K-3 sustain into later grades. Essentially, the investment is hardly worthwhile if student outcomes do not improve. Although current research generally supports the notion that smaller class size can lead to improved student performance, that view is not universally held among researchers.

Glass and Smith (1979) conducted an early and comprehensive meta-analysis of the class size literature. They identified more than 300 studies going back as far as 1895 on the topic. Of those 300, 77 met their decision rules for inclusion in the meta-analysis. They calculated a total of 725 effects from the 77 studies. Based on their analysis of those studies, Glass and Smith concluded:

- There is a clear and strong relationship between class size and student achievement. Sixty percent of the 725 effects showed higher achievement in smaller classes.
- Students learned more in small classes.
- Class size needed to be reduced to less than 20 students, preferably to 15, if strong impacts on student learning were to be found.

These are strong and important conclusions, and many have used them to support calls for reducing class size to less than 20. Not everyone in the research community found this work to be convincing. Slavin (1984) criticized meta-analysis arguing that the technique gives equal weight to all study findings, regardless of the quality of the study design. He argued that only 14 of the 77 studies in the Glass and Smith meta-analysis were methodologically sound. He also criticized meta-analysis generally, suggesting that the technique combined studies that are on different topics while claiming to address the same topic. For example, one of the methodologically sound studies with large effects in the Glass and Smith sample had to do with learning how to play tennis.

Slavin (1989) reanalyzed the methodologically sound studies from the Glass and Smith work, and pointed out that there were relatively few studies with fewer than 20 students in a class, and that there were no classes with between 4 and 14 students. He argued that the Glass and Smith findings were thus based on statistical interpolations of the findings in the 14 studies. He also concluded that the effects of reduced class size on student achievement were considerably smaller than Glass and Smith had determined.

Using these data from earlier meta-analyses, Odden (1990: 217) suggested that the research on class size supports "dramatic – and only dramatic – class size reductions." While he did not necessarily put a figure on what class size should be, Odden argued that reducing class size from 28 to 26, or from 24 to 22 would not be effective. He argued that class size needed to be reduced substantially more – to something like 15 to 17 students per class. This line of reasoning has

major implications for policymakers interested in reducing class size. States with large class sizes will need to spend substantial sums of money to make those "dramatic" class size reductions if the policy is to succeed.

Hanushek (1989) argues that resources do not necessarily effect educational outcomes. He reviewed 152 studies that used the pupil-teacher ratio as an independent variable in estimating the impact of spending and resources on student outcomes. Hanushek found only 27 studies with statistically significant findings, and only 14 of those found that reducing the number of pupils per teacher was positively correlated to student outcomes, while 13 found the opposite. Among the other 125, Hanushek found that 34 found a positive effect, 46 a negative effect and in the remaining 45 the direction of the effect could not be determined.

More recently, Hedges, Laine and Greenwald (1994) and Greenwald, Hedges and Laine (1996), after reviewing the same studies came to the opposite conclusion. Relying on newer and more sophisticated statistical techniques they argued that smaller classes did matter. Their analysis found that there were substantial gains is student performance when more money was spent on education, and that smaller class size was related to performance gains as well. Others have reached that conclusion as well. Ferguson (1991) analyzed the effect of class size and teacher preparation on student achievement in Texas, concluding that in elementary grades lower pupil-teacher ratios contributed to increases in student achievement.

In a recent study in Alabama, Ferguson and Ladd (1996) attempted to address some of the weaknesses of earlier studies in this area. They used larger samples of students, better model specification and had access to better data than in the past. They concluded that teacher test scores, teacher education and class size "appear to affect student learning" (Ferguson and Ladd, 1996:288). They also attempted to ascertain the threshold below which further reductions in class size would no longer lead to systematic achievement gains for students. They believe that if such a threshold exists, it is in the range of 23 to 25 students per teacher. This number seems somewhat high compared to other results, but could be a result of the relatively low per-pupil spending in Alabama and the generally larger class size in that state during their study. More importantly, Ferguson and Ladd sought to measure actual class size, rather than the district or school pupil-teacher ratio. Consequently, their work may reflect a more accurate picture of the number of students in a classroom at any time.

One of the problems with this line of research has been the lack of a true experimental design. In fact, only one study with such a design has been undertaken. The Tennessee Student-Teacher Achievement Ratio Experiment (STAR) relied on an experiment in which children were randomly assigned to classes with low pupil-teacher ratios and high pupil-teacher ratios. The study design placed students into one of three groups. An experimental group where the average class size was 15.1 students, and two control groups: a regular size class with an average of 22.4 students and a regular size class with a teacher's aide and an average class size of 22.8 students. Under the study plan, each student was to stay in the original class size assignment until the third grade. Following third grade, the experiment was concluded and all students assigned to regular size classrooms. Standardized tests were given each school year to measure student achievement. While there are some methodological and data problems in any study of this magnitude, two

respected researchers have argued that the Tennessee STAR project is the best designed experimental study on this topic to date (Mosteller, 1995; Kruger, 1998). Kruger (1998) summarized the major findings of the Tennessee STAR project as follows:

- At the end of the first year of the study, the performance of students in the experimental classes exceeded that of the students in the two control groups by five to eight percentile points.
- For students who started the program in kindergarten, the relative advantage of students assigned to small classes grew between kindergarten and first grade, but beyond that the difference is relatively small.
- For students who entered in the first or second grade, the advantage of being in a small class tended to grow in subsequent grades.
- There is little difference in the performance of students in the regular size classrooms compared to the performance of students in regular size classrooms with teacher aides.
- Minority students and students who qualify for free and reduced price lunches tended to receive a larger benefit from being assigned to small classes.
- Students who were in small classes have shown lasting achievement gains through the seventh grade.

There are a number of important policy issues brought forward by the findings from Tennessee STAR. First, the results of the evaluation suggest that smaller classes do lead to improved student performance, and that those performance gains are maintained at least through the seventh grade. Recently, Nye, Hedges, and Konstantopoulos, in a 5-year follow up study, wrote that although some students “dropped-out”, they dropped out having attained a higher level of achievement than their peers in larger classes. Moreover, the results suggest that alternative models that rely on the use of teacher aides to reduce the “effective class size” may be ineffective.

The research also suggests that simply reducing class size without changing how teachers of smaller classes deliver instruction is unlikely to improve student performance. It is important that teachers take advantage of the smaller classes to offer material in new and challenging ways identified through research. Absent that effort and the training needed to accompany such a change, expenditures for class size reduction may be relatively ineffective.

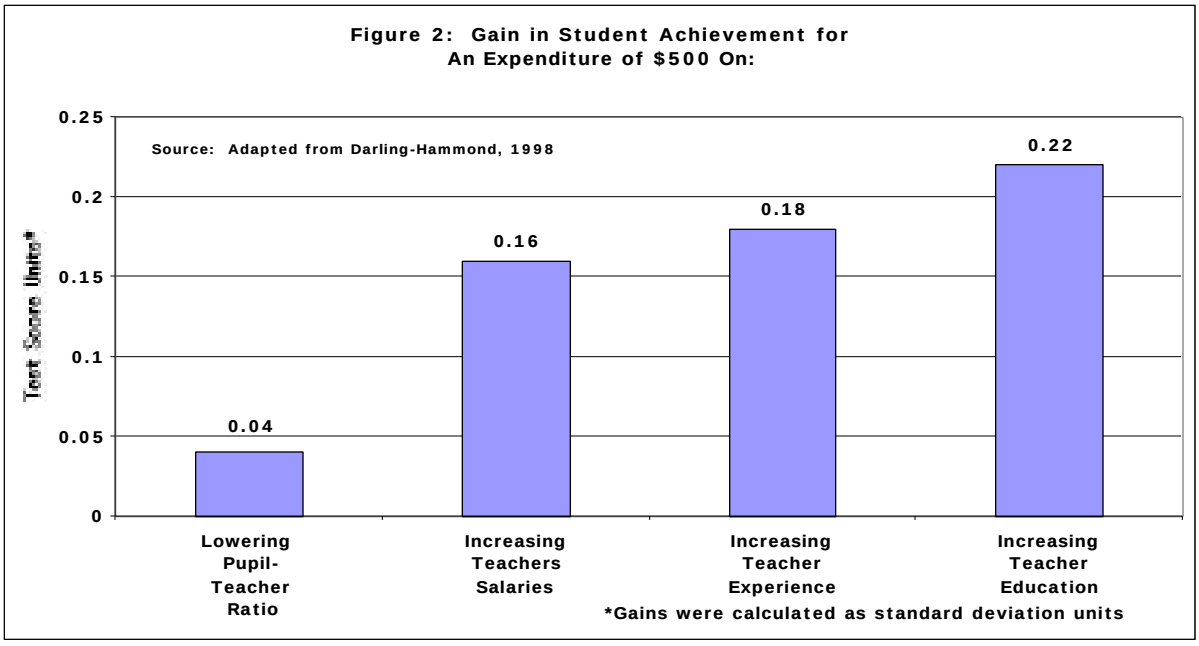
The preponderance of the evidence seems to be that smaller class sizes in the primary grades improves student achievement. Despite all the studies, however, it is still unclear what the “right” class size is or what grades should be affected. As noted above, the difference in cost between the class size of 15 touted by Odden and the class size of 23 found sufficient by Ferguson and Ladd is substantial in terms of both teachers and classroom space. More importantly, research shows that there are alternative reforms that may be considerably more cost effective in improving student performance. In particular, many have argued that investments in additional teacher training and professional development will lead to even greater gains in student performance for each dollar spent.

Cost-Effective Alternatives

The research reviewed above shows that reducing class size can, and probably does, lead to improved student performance. It is, however, a very expensive option. Before embarking on a substantial class size reduction program, policymakers may want to consider whether or not more cost effective alternatives exist. Current research suggests that such alternatives are available and should be considered, either instead of – or in addition to – class size reduction. One range of options deals with teacher knowledge and skills, while others relate to the structure of the education program offered at individual schools.

Reducing class size gives students greater access to teacher resources. There is evidence this will help students learn. However, what the teacher knows and is able to do is at least as important in helping students learn. Darling-Hammond (1998:1) argues that "teacher expertise is one of the most important factors in determining student achievement…" She quotes Greenwald, Hedges and Laine's work in showing the relative impact of spending $500 more per pupil on increased teacher education, increased teacher experience, and increased teacher salaries. All three of these appear to have a greater impact on student test scores than does lowering the pupil-teacher ratio. Figure 2 shows the differences graphically: For an expenditure of $500, the greatest gains in student test scores (measured in standard deviation units from a range of tests in 60 studies) were found through increasing teacher education. Lowering the pupil-teacher ratio was the least cost effective of the four methods. Increasing teacher salaries and experience fell between lower pupil-teacher ratios and teacher education in terms of cost effectiveness.

Ferguson (1991) found that the effects of teacher expertise in Texas were so great that after



controlling for socioeconomic status, disparities in achievement between black and white students were virtually entirely explained by differences in teacher qualifications. He found that teacher qualifications explained 43 percent of the variation among the factors affecting math

score test gains, while small classes and schools only accounted for eight percent of the gain. Home and family factors were identified as explaining the remaining 49 percent of the variance.

Darling Hammond (1998:1) summarizes these findings by stating that "teachers who know a lot about teaching and learning and who work in settings that allow them to know their students well are the critical elements of successful learning." Clearly smaller classes are better in her view, but given limited funds to invest, her work suggests policymakers should at least take a close look at improving access to high quality professional development first.

Professional development is frequently poorly funded in school districts and often the first item to be cut when finances become tight. Darling-Hammond's research suggests this may be a mistake, and in fact, more resources should be put into professional development. If class size is still reduced, professional development may be essential to help teachers maximize their skills given the reduced number of children for whom they are responsible. Certainly investments in professional development would be complementary to class size reduction programs.

Reducing class size and providing greater training opportunities for teachers are not the only options available for improving student learning. There are many things school site leaders themselves can do to restructure for improved learning. Many of today's educational reform are restructuring how educational resources are used. A number of the reform designs supported by the New American Schools (NAS) rely on using teaching resources differently, rather than purchasing more. While seven designs supported by NAS require some investment on the part of a school or school district, most are less expensive than dramatic reductions in class size or pupil-teacher ratios.[31] Most also come with substantial teacher training components.

Odden and Busch (1998) found substantial gains in student performance, often as high as one-third of a standard deviation, at NAS design schools. These schools reach these performance levels with relatively little additional expenditures, generally averaging around $50,000 to $250,000 a year for a school of 500 students (an extra $100 to $500 per pupil each year). Odden and Busch argue that any school can reorganize itself into one of the NAS designs by looking closely at its current allocation of teachers and aides and reassigning them as needed to meet the design specifications. In many instances this calls for eliminating many of the aides in favor of more teachers. Given the results of the Tennessee STAR project reported above, spending for teacher aides may not be productive anyway.

Another option schools can consider is restructuring the use of time. The National Commission on Time and Learning (1994) reported on a number of successful schools and school districts that had improved student performance through different ways of organizing the school day to give students more access to, and time with, teachers. Models that provide more access to learning resources, particularly teachers, may also be substantially more cost effective than class size reduction.

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[31] The seven school designs supported by the New American Schools include: the Modern Red Schoolhouse; Expeditionary Learning-Outward Bound; National Alliance; Audrey Cohen College; Co-NECT; ATLAS; and Roots and Wings (New American Schools, 1996; Stringfield, Ross and Smith, 1996). An eighth design, Urban Learning Center Schools, was not part of the Odden and Busch analysis.

Conclusion

Class size reduction is currently one of the most popular – and most expensive – educational reforms. At least 19 states have enacted mandatory or voluntary policies aimed at reducing class size in the primary grades, and one (California) has even created an incentive to reduce the number of students in 9th grade English and Math classes.

The question facing state policymakers is should substantial investments in smaller classes be made? The research shows that such investments can lead to improved student outcomes. However, the research also shows that attention to teacher training and expertise may have a bigger payoff per dollar spent. Moreover, as California's experience shows, states that jump into a major class size reduction program quickly may find they have a shortage of qualified teachers. Given the importance of high quality teaching to student learning, investment in the quality of the teaching force first might be a better way to maximize the potential of the dollars that are used to reduce class size. In short, few appear to oppose class size reduction. However, there are a number of things states and school districts can do to insure that the substantial investment made in teachers and classrooms pays off to the maximum extent possible. Virtually all of them revolve around insuring that the state has the highest quality teaching force possible.

Table 1
States with Class Size Reduction Measures

State	Mandate or Incentive	Class Size Limit	Grade Level Affected	Year Implemented	Funding
Alaska	Mandate	18	K-3	1997	Part of Foundation Program
California	Incentive	20	K-3	1996	$1 billion in 1996-97 ($650/student in smaller classes plus $200 million for facilities). $1.5 billion in 1997-98 ($800 per student in smaller classes)
Florida	Incentive	20 (30 with full time aide)	K-3	1996	$100 million for 1997-98
Illinois	Incentive	Reduce class size with reading improvement block grants	K-3	1997	Unknown
Indiana	Incentive	18 20	K-1 2-3	1981 1988	$77 million through funding formula in 1995
Louisiana	Mandate	Not to exceed 20 without State Supt. Authorization	K-3	1986	Unknown
Maine	Incentive	15 to 18	K-3	1989	Competitive Grant Program
North Carolina	Incentive	23	K-2	1993 1995 1997	Part of foundation program
Nevada	Mandate	15	K-3 Core subjects	1989 1995	Special Revenue Fund
Oklahoma	Mandate	No more than 20 students may be assigned to a teacher	K-6	1990	Part of foundation program
Rhode Island	Incentive	Encouraged to reduce class size to no more than 15	K-3	1987 1996	Educational improvement block grants
South Carolina	Mandate	21	1-3 (math and reading classes)	1977	Through foundation program with pupil weights of 1.3 for K and 1.24 for 1-3.
South Dakota	Incentive	15	K-3	1993	Voluntary Grants for up to 3 years

Table 1 (Continued)
States with Class Size Reduction Measures

State	Mandate or Incentive	Class Size Limit	Grade Level Affected	Year Implemented	Funding
Tennessee	Mandate	20	K-3	1985	Part of foundation program
Texas	Mandate	22	K-4	1984	Unknown
Utah	Mandate	18	K-2 If attained at K-2 than allocation can be used in 3-4	1992	Weighted pupil funding formula distributes funds over four years
Virginia	Incentive	Long term goal to reduce class size in schools with high or moderate concentrations of at risk students	K-3	1996	State incremental funding along with local district match
Washington	Both	~18.42	K-3	1987-88	Part of basic aid formula along with incentive funding
Wisconsin	Incentive	Reduction of class size a requirement for receiving student achievement grants	K-3	1995	Funded through finance formula if part of special program

Source: Derived from Education Commission of the States, 1998

Appendix C: Use of Production Functions in Education Finance[32]

Ask most teachers or school administrators if they could do a better job educating children if they had more money, and virtually every one of them will offer a resounding "yes." Ask them what they would do with that money, and their answer is less clear. Many educators do not have a strategic sense of how the money could be used, and more often than not the answer will conflict with what other teachers or administrators say is needed.

Today's school reformers increasingly call for greater productivity in our schools. As Monk (1992) shows, productivity is a difficult concept to apply to a public good like education. Nevertheless, for the purpose of this report, here is a straightforward working definition of *educational productivity*: the improvement of student outcomes with little or no additional financial resources, or a consistent level of student performance at a lower level of spending. Although a simple idea, improvements in student achievement absent large amounts of new money have been relatively rare in public schools in the United States.

One of the difficulties in discussing educational productivity is the many different ways it can be addressed. The first section of this appendix reviews the literature that seeks to answer the question, “Does money matter?”

The second section discusses how educational productivity can be improved through decentralized management structures. The literature on school-based management and decentralized decision-making is analyzed to determine whether and how these tools can be used to make schools better or more productive.

Measuring Educational Productivity

One can measure educational productivity through three lenses: efficiency, effectiveness, and equity. *Efficiency* refers to the allocation of resources and their use in schools. Specifically, efficiency concerns revolve around how much money schools have, and how that money is used. *Effectiveness* encompasses the linkage between student outcomes and the level and use of financial resources in the schools. This topic, a matter of considerable debate in educational and economic circles, is the focus of this section. The third approach to measuring productivity is *equity*, the equitable distribution of funds to all children.

Virtually all effectiveness studies rely on an economic method known as the *production function*. While this is not necessarily the only way to measure the effectiveness or productivity of a school system, it has been the method most frequently used. This section begins with a discussion of production functions and how they are used. The next part considers the use of production functions more generally in trying to ascertain the connection between money and student learning.

The Current Debate: Does Money Matter?

[32] This Appendix is adapted from a chapter in a book being written by Lawrence O. Picus.

While interest in the question of whether money matters has always been high, the publication of an article by Hedges, Laine, and Greenwald (1994a) in the April 1994 *Education Researcher* sparked renewed debate over this issue. Prior to publication of this article, the most often cited research in this field was the work of Eric Hanushek (1981, 1986, and 1989). In those articles, as well as his most recent research, Hanushek (1997) argues that there does not appear to be a systematic relationship between the level of funding and student outcomes.

Hanushek has now analyzed 90 different publications, with 377 separate production-function equations. In the summer 1997 issue of *Educational Evaluation and Policy Analysis,* he continues to argue that "these results have a simple interpretation: There is no strong or consistent relationship between school resources and student performance. In other words, there is little reason to be confident that simply adding more resources to schools as currently constituted will yield performance gains among students" (Hanushek 1997, p. 148).

To reach this conclusion, Hanushek followed a process that separates the studies on the basis of the outcome measures employed by the authors, and then looks at the regression results. The regressions use a series of independent or descriptor variables to estimate the value of the dependent or, in this case, outcome variable. The regression estimates the nature of the relationship between the independent variables and the dependent variable, measures the estimated strength of that relationship, and indicates whether the estimate of the effect is statistically significant (whether one can say with some level of confidence that the answer is different from zero).

For example, let’s say the researcher is interested in whether more money leads to higher test scores. If the sign on the coefficient of expenditures is positive, the implication is that higher spending leads to higher test scores. However, one needs to be sensitive to the magnitude of that relationship and the confidence one has about that estimate (the statistical significance).

Hanushek, using this same method, divided the results of the 377 equations into five categories as follows:

- A positive relationship that is statistically significant
- A positive relationship that is not statistically significant
- A negative relationship that is statistically significant
- A negative relationship that is not statistically significant
- A situation where the direction of the relationship can not be determined

In addition to school expenditures, some of the studies relied on other measures of school district resource allocation; they looked at teacher/pupil ratios,[33] expenditures for central or school-site administration, teacher education, and teacher experience.

[33] While it is generally easier to think in terms of a pupil/teacher ratio, the advantage of reversing this ratio and considering a teacher/pupil ratio is to simplify discussion. Typically a lower pupil/teacher ratio is more expensive and considered a positive step toward improving student performance. However, if smaller classes lead to higher student performance, then the relationship between the pupil/teacher ratio and the outcome measure will be negative.

Hanushek analyzed the studies and placed them in one of the five categories based on the estimated effect described above. In looking across studies, at different outcome measures and different types of inputs, Hanushek argues that the variation in findings is such that systematic relationships between money and outcomes have not yet been identified. He states:

> The concern from a policy viewpoint is that nobody can describe when resources will be used effectively and when they will not. In the absence of such a description, providing these general resources to a school implies that sometimes resources might be used effectively, other times they may be applied in ways that are actually damaging, and most of the time no measurable student outcome gains should be expected. (Hanushek 1997, pp. 148-9)

He then suggests that what is needed is to change the incentive structures facing schools so that they are motivated to act in ways that use resources efficiently and that lead to improved student performance.

One of the most interesting findings in Hanushek's (1997) recent work is the impact of aggregation on the results. Studies that use data aggregated to the state level, he found, are far more likely to find statistically significant and positive relationships than are studies that focus on the classroom or school level. What is not clear from his work at this point is whether the aggregation is masking much of the variance that exists (a likely occurrence), or if we simply do not yet have tools that are refined enough to adequately measure the effects of different inputs at the most disaggregated levels in the system.

Others have looked at the same studies as Hanushek and concluded that they show money does make a difference. Hedges, Laine, and Greenwald (1994a, 1994b; see also Laine, Greenwald, and Hedges 1996; and Greenwald, Hedges, and Laine 1996a, 1996b) conclude that, in fact, money can make a difference. They argue that while in those studies only a minority of relationships indicate a positive, statistically significant relationship, the number with such a relationship exceeds what one would expect to find if the relationship were random. They also point out that one would expect the statistically insignificant studies to be evenly divided between positive and negative effects, yet in this category as many as 70 percent of the relationships between per-pupil expenditures and student performance are positive. Relying on this and other evidence, Hedges, Laine, and Greenwald (1996a) conclude that school spending and achievement are related. In his rejoinder, Hanushek (1994b) argues that while there is evidence that the relationship exists, there is not evidence of a strong or systematic relationship.

A number of other studies have looked at this issue. Ferguson (1991) examined spending and the use of educational resources in Texas. He concluded that "hiring teachers with stronger literacy skills, hiring more teachers (when students-per-teacher exceed 18), retaining experienced teachers, and attracting more teachers with advanced training are all measures that produce higher test scores in exchange for more money" (Ferguson 1991, p. 485).

If the ratio is reversed, so that it is a teacher/pupil ratio, the higher the teacher/pupil ratio, the smaller the class size. Thus if small class size leads to improved student performance, the sign on the coefficient will be positive.

Ferguson's findings also suggest that the education level of the adults in the community, the racial composition of that community, and the salaries in other districts and alternative occupations affect teachers' selection of districts in which they want to teach. This implies, according to Ferguson, that better teachers will tend to move to districts with higher socioeconomic characteristics if salaries are equal. If teacher skills and knowledge have an impact on student achievement (and Ferguson, as well as others, suggest that they do), then low socioeconomic areas may have to offer substantially higher salaries to attract and retain high-quality instructors. This finding, if correct, would help confirm a link between expenditures and student achievement.

In a more recent study, Weglinsky (1997) used regression analysis of three large national databases to see if expenditures had an impact on student achievement of fourth- and eighth-graders. He found that the impact of spending was in steps or stages. For fourth-graders, Weglinsky concluded that increased expenditures on instruction and on school district administration increase teacher-student ratios. Increased teacher/student ratios (smaller class sizes) in turn lead to higher achievement in mathematics.

In the eighth grade the process was more complex. Weglinsky found that increased expenditures on instruction and central administration increase teacher/student ratios (reduce class size). This increased teacher/student ratio led to an improved school environment or climate, and the improved climate and its lack of behavior problems resulted in higher achievement in math.

Equally interesting was Weglinsky's (1997) finding that capital outlay (spending on facility construction and maintenance), school-level administration, and teacher-education levels could not be related to improved student achievement. This is particularly intriguing in light of his finding that increased spending for central or district administration was associated with improved student outcomes. These findings, certain to be controversial, conflict to some extent with the "conventional wisdom" about school administration. Why additional spending on district administration leads to improved teacher/student ratios, whereas that is not the case with school-site administration, is not clear, but this anomaly should be investigated further and considered by school districts when they evaluate the move to site-based management.

In summary, there remains considerable disagreement over the impact of additional resources on educational outcomes of students. The complexity of the educational system, combined with the wide range of outcomes we have established for our schools, and the many alternative approaches we use to fund our schools make it difficult to come to any firm conclusions about whether or not money matters.

Methodological Challenges

One of the problems with all the studies described above is that they do not take into consideration the similarity with which school districts spend the resources available to them. Research by Picus (1993a and 1993b), Picus and Fazal (1996), and Cooper (1993 and 1994), shows resource-allocation patterns across school districts to be remarkably alike, despite differences in total per-pupil spending, student characteristics, and district attributes. This does

not mean that all children receive the same level of educational services. As Picus and Fazal (1996) point out, a district spending $10,000 per pupil and $6,000 per pupil for direct instruction is able to offer smaller classes, better paid and presumably higher quality teachers, and higher quality instructional materials than is a district spending $5,000 per pupil and only $3,000 per pupil for direct instruction.

What we do not know is what the impact on student performance would be if schools or school districts were to dramatically change the way they spend the resources available to them. In 1992, Odden and Picus suggested that the important message from the research summarized above was that, "if additional education revenues are spent in the same way as current education revenues, student performance increases are unlikely to emerge" (Odden and Picus 1992, p. 281). Therefore, knowing whether high-performing schools use resources differently than other schools would be helpful in resolving the debate over whether money matters.

Nakib (1996) studied the allocation of educational resources by high-performing high schools in Florida and compared those allocation patterns with the way resources were used in the remaining high schools in that state. A total of seven different measures were used to compare student performance. In his findings, Nakib shows that per-pupil spending and per-pupil spending for instruction were not statistically significantly higher in high-performing high schools, largely because of the highly equalized school-funding formula used in Florida. On the other hand, he found that the percentage of expenditures devoted to instruction was lower in the high-performing high schools, implying high-performing high schools may actually spend more money on resources not directly linked to instruction than do other high schools.

Unfortunately, the results of this Florida analysis do little to clarify the debate on whether money matters. The comparison of high-performing high schools with all other high schools in Florida did not show a clear distinction in either the amount of money available or in the way resources are used. As with many other studies, student demographic characteristics were found to have the greatest impact on student performance.

More recently, Odden (1997) has found that the schooling designs developed as part of the New American Schools project have generally led to increased student performance. In each of the seven models he studied, schools are required to make substantial reallocations of resources. They hire fewer aides and teachers with special assignments and instead employ a greater number of regular classroom teachers, thus lowering average class size. In addition, each of the designs requires substantial investments, in both time and money, for professional development. Odden suggests that this can often be funded through elimination of a position through attrition. His optimistic assessment is that for relatively little additional money, schools can fund existing programs and organizational structures that will help them improve student learning.

Why is Educational Productivity So Elusive?

To date, economists who have attempted to define a production function for education have been largely unsuccessful. Much of the variation in student performance from school to school is related to student characteristics over which schools have no control. Moreover, recent research

on educational resource-allocation patterns shows little variation in the way school districts use the funds they have, regardless of per-pupil spending levels (see, for example, Odden, Monk, Nakib, and Picus 1995; Picus and Fazal 1996).

As a result, it has been difficult to identify productive uses of school funds. Before looking at potential ways to break these patterns and improve productivity, it will be helpful to consider some possible reasons these patterns exist.

Financial Organization of School Districts

School districts are typically organized in a top-down fashion, particularly with regard to their fiscal operations. There are a number of reasons for this. First, since schools spend public funds, it is essential that district administrators ensure the money is spent as budgeted and approved by the school board. Considerable expense goes into developing systems that provide this accountability, and it is easier to manage these systems centrally. Moreover, few school-site administrators have the training or desire to become financial managers. Thus school district accounting systems have become highly centralized.

Central fiscal management has its benefits in terms of centralized purchasing and common reporting formats, but it can also reduce local creativity. Most school districts rely on allocation mechanisms to distribute resources to school sites (Hentschke 1986). These mechanisms typically allocate resources such as teachers on a per-pupil basis, and others on either a per-pupil or dollar-per-pupil basis. Depending on the level of detail in a district's system, these allocation mechanisms often leave very little discretionary authority to the school site.

Moreover, most systems do not allow school sites the flexibility to carry over funds if expenditures are below budgeted levels. Although this pattern is changing, to the extent it still exists, schools have little incentive to create long-term plans, and they find themselves better off looking for ways to be sure they have spent all the funds allocated to their site each fiscal year.

School District Budgeting

Budgeting systems also work to limit variation in school spending patterns. Wildavsky (1988) describes public budgeting systems as being incremental. The bulk of a public organization's budget, he notes, is based on the same allocation pattern as the previous year, adjusted for changes in costs due to inflation, salary increases, and price increases. Consequently, changes in spending patterns are unlikely, and when they occur, do so at the margin. That is, it is only after current expenditures are "covered" that new programs are considered, if more money is available.

It is not surprising that school districts have highly incremental budgets. The basic organization of a school district is to put a number of children in a classroom with a teacher. The balance of a school system is designed to support that structure. Depending on local preferences, this includes a central administrative office, school-site administrators, specialists and student-support personnel, aides, and classified staff to handle clerical, custodial, transportation, and other

activities. Each year the typical district budgets funds to cover the staff, materials, and fixed costs of the previous year. If funds are inadequate, then it is forced to make reductions, usually at the margin. If new programs are desired, new resources must be found.

Assuming large gains in productivity are desired, it seems that dramatic changes in the ways resources are allocated and used will be needed. Doing so requires breaking the patterns noted above.

What is a Production Function?

As Picus (1997) points out, nearly all would agree that more money is better than less. Moreover, most would agree that the expenditure of additional funds on education should lead to improved student learning. However, there is considerable disagreement among researchers whether a statistical link can be found between student outcomes and money (or what money buys, such as lower class size, teacher experience and degrees, and so forth). The single largest expenditure item for a school district is teacher compensation (salary and benefits). So, for example, for a district of a given size, the more money or revenue available to the system, the more teachers it can hire and the smaller the average class size will be.

Production functions are an economic tool used to measure the contribution of individual inputs to the output of some product. In simple terms, a production function takes the following form:

(1) $O = f(K,L)$

Where:

O = some measurable output

K = Capital or non-labor inputs to the production process

L = Labor

By estimating equations that include these variables, as well as other variables that control for exogenous factors known to impact the production process, it is possible to predict the impact that the application of additional units of labor and capital will have on the number of units of output produced.

This concept can be applied to education as well.[34] For example, it is possible to estimate an educational production function with the following form:

(2) $P = f(R,S,D)$

Where:

P = A measure of student performance

R = A measure of resources available to students in the school or district

S = A vector of student characteristics

D = A vector of district and school characteristics

One possible measure of R would be the pupil-teacher ratio at a school or school district. In fact, the pupil-teacher ratio is in many ways a good choice for this particular variable as it provides a proxy for the level of resources available for children (that is, it is highly correlated with per-pupil spending), and it is a proxy for class size.

Difficulties with the Educational Production-Function Research

There are substantial methodological difficulties with estimating equations of the form presented above. First and foremost is reaching agreement on the proper measure of student performance to serve as the outcome indicator. Although there is considerable discussion about this in the education community, in recent years, the policy community—as well as most educators—have focused on the results of standardized tests as the outcome measure. The studies described below generally follow this trend.

There are a number of other methodological problems to consider. There is substantial evidence that children from minority backgrounds, children from low-income families, children who do not speak English as their first language, and children with disabilities do not do as well in school as other children. Therefore, if our model is to identify the impact that smaller classes have on student performance, it is necessary to control for differences in student characteristics.

[34] For a more detailed description of production functions as they apply to education, see Monk (1990).

Unfortunately, it is often difficult to collect these data in ways that facilitate the estimation of a production function.

For example, it is often possible to collect data on student performance and student characteristics at the individual student level. However, other data related to school or district characteristics may be available only at the district level. This is often the case with fiscal data such as per-pupil expenditures and even pupil-teacher ratios. As a result, the regression equations contain variables with varying levels of precision. Unfortunately, the accuracy of the estimates of the impact of resources on student performance is only as good as the lowest level of precision. This is often the district-level fiscal or resource data that are of interest to the researcher. There are statistical techniques to minimize this problem, in particular, Hierarchical Linear Modeling (HLM). However, many of the early studies on the effect of class size did not use this tool.

Another problem is that most education production-function studies rely on cross-sectional data. This approach allows for a snapshot of one point in time. Yet many of the student characteristic and schooling variables used in these equations are subject to substantial change over time. Thus it is not clear that reliance on a one-time measure of these characteristics will adequately control for their effects on student performance. Longitudinal data sets, which would resolve many of these problems, are expensive to collect, and few are available to researchers today.

In addition, there are substantial problems with the inputs actually measured for this research. The pupil-teacher ratio often used as a proxy for class size is an example. Picus (1994b) shows that there is considerable variation between the computed pupil-teacher ratio in a district or school and teachers' self-reported class size. While self-reported class size averaged 50 percent larger than the computed pupil-teacher ratio, this figure ranged widely from one or two students more than the computed ratio to more than double that figure. Thus, if one is trying to estimate the effect of class size on student performance in a school or district, the pupil-teacher ratio may not accurately reflect either the class size or the variation that exists in the number of students each teacher sees in a day. A final problem with this research is that it is generally impossible to establish a true experimental design with both an experimental and a control group.

Summary

Production-function research has been used extensively to try to understand whether and how money matters. To date, the research findings have been mixed. This does not imply that money does not matter, only that when using this economic technique, we have yet to conclusively find *how* it matters. The relationship between money and student learning is not clear cut, but rather is influenced by a wide range of factors in our schools. Understanding the impact of these factors on students, teachers, and other participants in the educational process will help further our ability to learn the best ways to ensure that the money we spend on schools leads to improved student outcomes.