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ABSTRACT

Formula budgeting procedures used in several states for allocating resources to public institutions of higher education are reviewed and criteria to be considered in developing a formula budget for public institutions in Pennsylvania is recommended in this report. Section 1 summarizes the history of formula budgeting in Pennsylvania. Section 2 reviews the use of formula budgeting procedures nationally and discusses the advantages and disadvantages of these procedures. Further it reviews the philosophy, rationale, and components that are considered in different types of formulas. Section 3 provides a description of the various types of formulas that have been, currently exist, or are proposed by 10 different states: Alabama, Louisiana, New Mexico, Ohio, Oklahoma, Tennessee, Texas, Virginia, and Washington. Section 4 reviews the process employed by three states, California, Illinois, and Texas, in the development and maintenance of formula budgeting and problems associated with this process. Finally, Section 5 presents a set of recommendations concerning the major components that should be considered in the development of formula budgets for state-owned, state-related, and community college sectors of the Pennsylvania system of higher education. The appendix provides a summary of each formula used and provides a technical description of the formula budget of each state. (Author)

PREFACE

This report reviews formula budgeting procedures used in several states for allocating resources to public institutions of higher education and recommends criteria to be considered in developing a formula budget for public institutions in the Commonwealth of Pennsylvania.

Section 1 summarizes the history of formula budgeting in the Commonwealth. Section 2 reviews the use of formula budgeting procedures nationally and discusses the advantages and disadvantages of these procedures. Further it reviews the philosophy, rationale and components that are considered in different types of formulas. The purpose of this section is to establish a conceptual framework that will facilitate the analysis of individual state formulas that are presented in Section 3. Section 3 provides a description of the various types of formulas that have been, currently exist, or are proposed by 10 different states. Section 4 reviews the process employed by three states in the development and maintenance of formula budgeting and problems associated with this process. Finally, Section 5 presents a set of recommendations concerning the major components that should be considered in the development of formula budgets for state-owned, state-related and community college sectors of the Commonwealth System of Higher Education. The appendix of this report provides the reader with a summary of each formula utilized and provides a technical description of the formula budget of each state.

The major focus of this report is that of a technical review of formula budgets and secondarily the processes that are associated with the development, implementation, and maintenance of formula budgets. The selection of the 10 states was based upon the criteria of diversity of the philosophies and components included in the budget as well as the availability of information.

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1.0 INTRODUCTION

1.1 Definition of Budget Formulas

A budget formula is an objective procedure whereby future budgetary requirements are determined through manipulation of quantitative data which reflect relationships between programs and costs (Miller, 1964, p. 6). Gross (1973) also points out that a formula may consist of several components reflecting distinct functional budget areas, which may be represented mathematically.

1.2 Purpose of the Study

The purpose of this paper is:

1) to present a background in the concepts, approaches, and methodologies of state budget formulas;
2) to review the budget formulas of selected states;
3) to discuss the evolution of budget formulas from introduction to dissolution; and
4) to recommend guidelines for the development and implementation of a budget formula for the state-owned, state-related, and community college sectors of the Commonwealth System of Higher Education.

In 1973, Gross conducted an extensive survey and analysis of the existing state budget formulas. A number of changes have occurred since that study was conducted. Certain states have adopted budget formulas; others have suspended their use. In addition, formula factors and the methodologies used have in many instances changed since the early 1970s. For these reasons, this study has been undertaken to update the earlier Gross study by examining the budget formulas of ten states:

Alabama	Oklahoma
Louisiana	Tennessee
Michigan	Texas
New Mexico	Virginia
Ohio	Washington

These states reflect considerable diversity in the approaches taken to formula budgeting. This analysis provides, therefore, a broad framework for assessing

experience nationally in the design and structure of budget formulas, and a sound basis for recommendations concerning the development of a budget formula for public colleges and universities in Pennsylvania.

1.3 Formula Budgeting in the Commonwealth of Pennsylvania

In 1966 the State Board of Education adopted the Master Plan for Higher Education in Pennsylvania which placed into perspective the desired role of formula budgeting in the Commonwealth system of higher education.

> Even here, however, sound public policy dictates that appropriations should be based, not upon the popularity of particular causes or upon institutional influence, but rather upon an equitable distribution which accomplishes the Commonwealth's major objective of providing varied educational opportunity at low cost (p. 37).

Suggestions were that a formula approach would:

1. provide state officials with guidelines for the equitable allocation of funds to the Commonwealth institutions;
2. represent a reasonably trustworthy method for determining total state support for higher education which should be appropriated; and
3. serve as a medium for both fiscal and policy review and planning for an extended period of time.

To address these purposes, the Master Plan recommended the development of a formula for determining the operating resource requirements of each institution. Factors to be included in the formula were: enrollment, per-student cost, faculty salary increases, faculty augmentation, supporting services, library support, departmental research, physical plant maintenance, continuing education, and community service. Separate formulas were to be developed for the state-owned sector and the state-related sector, and the costs of instruction was to be differentiated by levels of instruction (e.g. undergraduate, graduate, and professional).

In 1967, the President's Council of the State-Owned Colleges established the State College and University Formula Committee to develop a budget formula for the state-owned institutions (Schirato, 1974). This Committee was disbanded shortly thereafter, however, when funds were appropriated by the legislature to develop a statewide planning, programming, and budgeting system. Since PPBS would have established the institutional budgetary needs and costs, the work of this Committee was considered duplicative. These efforts also floundered, however.

To assist in the development of a formula for the state-related universities following the recommendations of the 1966 Master Plan, the Pennsylvania Department of Public Instruction in 1968 contracted with the firm of Heald, Hobson and Associates. Their report submitted in September, 1968 outlined a 12-step process for determining instructional costs which took into account several factors: credit hours, number and average salaries of teaching faculty; average salaries of graduate assistants and other professionals; fringe benefits; and other departmental operating expenses. Specific rates for each institution were also developed for the indirect costs of administration and general expenses, library costs, plant operation and maintenance, and student aid. Neither the Pennsylvania Department of Public Instruction nor the state-related universities accepted the Heald, Hobson recommendations, and the recommended formula was never implemented.

In 1971, the State Board of Education approved a new Master Plan for Higher Education in Pennsylvania. Unlike the 1966 Master Plan, the new plan did not take a position with regard to formula budgeting. Such an approach was mentioned only in passing with regard to graduate instruction in state-owned and state-related institutions. Specifically, "support...should continue at the existing rate based upon the present or modified subsidy formula uniformly submitted by institutions within a given segment, subject to review (p. 30)." In 1974, however, the idea of developing and implementing a formula for the state appropriation was again profferred by the Pennsylvania Association of Colleges and Universities in A Comprehensive Proposal for Financing Higher Education in Pennsylvania. That proposal explicitly stated that:

> Immediate efforts should be directed to the development and perfection of differentiated formulae as primary guides for arriving at appropriations for the State-owned and State-related colleges and universities in the Commonwealth. Different formulae are required for each of the two major segments in order to insure that purposeful differences in functions among public institutions are reflected. The funds allocated to each institution must be appropriate to the particular functions of that institution. (p. 19)

Recommendations concerning the components to be included were not made, and no further progress on the design and development of a budget formula for Pennsylvania institutions has been made.

Of the public postsecondary education sectors in the Commonwealth, only the community colleges are currently allocated funds for current operating

expenses and for capital expenses on a formula basis. The Community College Act of 1963, Act 484, as amended (Act 322), delineates the fiscal responsibilities of the local sponsor and the Commonwealth (Francis, 1977, p. 222).

> (b) The Commonwealth shall pay to a community college on behalf of the sponsor on account of its operating costs during an academic year from funds appropriated for that purpose an amount equal to one-third of such college's approved operating costs not to exceed one thousand dollars ($1,000) per student multiplied by the number of equivalent full-time students determined by an audit to be made in a manner prescribed by the State Board of Education. In addition the Commonwealth shall pay to a community college on account of its operating costs during a summer term from funds appropriated for that purpose an amount equal to one-third of such college's approved operating costs not to exceed five hundred ($500) per student multiplied by the number of equivalent full-time students... The Commonwealth shall pay to a community college on behalf of the sponsor on account of its capital expenses an amount equal to one-half of such college's annual capital expenses from funds appropriated for that purpose to the extent that said capital expenses have been approved as herein provided. (Misc 323.14)

2.0 THE DESIGN AND STRUCTURE OF STATE BUDGET FORMULAS

2.1 Functions, Advantages, and Disadvantages of State Budget Formulas

In 1973 Gross surveyed the state budgeting practices for appropriating funds to public institutions. At that time, as shown in Table 1, 25 states in some way utilized a formula as part of the budget process. In some cases, the formula was the basis for budget recommendations by the coordinative agency or institution to the legislature; in others, the legislature used the formula in making appropriation decisions. Since that time, however, patterns have changed. For example, Wisconsin's legislature suspended use of the formula

TABLE 1

EXTENT TO WHICH BUDGET FORMULAS WERE UTILIZED BY STATES IN 1973

STATE	BUDGET FORMULA USED	BUDGET FORMULA NOT USED	STATE	BUDGET FORMULA USED	BUDGET FORMULA NOT USED
Alabama	X		Montana		X
Alaska		X	Nebraska		X
Arizona		X	Nevada	X	
Arkansas	X		New Hampshire		X
California		X	New Jersey	X	
Colorado	X		New Mexico		X
Connecticut		X	New York	X	
Delaware		X	North Carolina		X
Florida	X		North Dakota	X	
Georgia	X		Ohio	X	
Hawaii		X	Oklahoma	X	
Idaho		X	Oregon		X
Illinois		X	Pennsylvania	X	
Indiana		X	Rhode Island		X
Iowa		X	South Carolina	X	
Kansas		X	South Dakota	X	
Kentucky		X	Tennessee	X	
Louisiana	X		Texas	X	
Maine		X	Utah		X
Maryland	X		Vermont		X
Massachusetts		X	Virginia	X	
Michigan		X	Washington	X	
Minnesota	X		West Virginia	X	
Mississippi	X		Wisconsin	X	
Missouri	X		Wyoming		X
			Totals	25	25

SOURCE: F. M. Gross, *A Comparative Analysis of the Existing Budget Formulas Used for Justifying Budget Requests for Appropriating Funds for the Operating Expenses of State-Supported Colleges and Universities*, Vol. 14, No. 9, (Knoxville: University of Tennessee, Office of Institutional Research, 1973).

during its last budget cycle; New Mexico has implemented a new formula approach; and Michigan has developed, but not yet implemented, a formula budgeting process. The use of state budget formulas remains widespread, however, and exhibits considerable diversity. According to Moss and Gaither (1976), budget formulas are typically adopted to:

1) reduce political uncertainties relating to state financial support;
2) improve equity in the allocation of funds among institutions and sectors;
3) insure adequacy in levels of support; and
4) provide a basis for greater accountability in the use of public funds.

Because of the objectivity inherent in a budget formula, it often is seen as a mechanism to reduce the political uncertainties associated with the state budgeting process. These uncertainties are represented by the role conflict resulting from differing levels of expectations among the legislature, the executive office, the state education board, and the institutions. In the absence of an objective basis for determining financial need, institutions exhibit uncertainty with respect to the amount of funds to request, and state agencies and legislative bodies face uncertainty as to how much to appropriate. Budget formulas can reduce the complexity of these decisions by providing an agreed framework for discussion of financial needs. The elements of the budget debate are clearly defined; the necessary information and analysis requirements of each agency are detailed prior to the start of the process; and institutional needs can be compared on the basis of understandable budgetary standards. By providing an agreed basis for discussion, the formula can reduce conflicts and uncertainties which typically characterize the state budgeting process. The extent to which this occurs, of course, is contingent on the perceived legitimacy of the formula in the eyes of the various agencies involved. This suggests involvement of all principal parties: institutions, coordinating boards, executive agencies, and legislative bodies, in the design and development of the formula.

A second objective of a budget formula is often to increase equity in the allocation of state government appropriations to institutions "to each according to its need." Equity, however, does not mean equality. That is, the decision is not to allocate the same amount of funds to all institutions, but rather to distribute monies on the basis of reasonable "fair share" of the resources, recognizing differences in mission, programs, levels of instruction, and costs. Budget formulas, to the extent that they are comprehensive

in their coverage of the functions of postsecondary institutions, provide a mechanism for determining the equitable share of total state support to be given to each institution. Important to this operational definition of equity are adequate provisions in the formula for determining program costs, measuring workload, and defining common components.

The achievement of equity in the allocation of state funds to higher education must be accompanied by assurance of adequate levels of financial support for both the system of higher education and institutions. Institutions must receive sufficient funds to develop and maintain educational programs essential to their public mission. Formulas can assist both institutions and public agencies in determining on an objective basis realistic levels of support necessary to sustain institutions and programs at acceptable levels of quality. Here, the formula can help focus on issues of program objectives, size, technology, and support. Formulas which address these basic concerns can provide a useful framework for justifying budget requests and for ensuring that levels of public support are fully adequate, but not excessive, to meet realistically-defined costs.

Finally, state budget formulas can assist in meeting the increasing demands for accountability. The use of a formula standardizes some dimensions of performance and budgetary data and facilitates comparative analysis of the various instructional, research, and public service programs within and among institutions. This factor is closely related to the function of reducing political uncertainty. By providing an agreed upon framework for budget analysis and discussion, the budget formula also clarifies those factors for which the institution will be held accountable.

Gross (1973, p. 197) has summarized the major advantages of implementing state budget formulas.

(a) Budget formulas can be developed which estimate the funding requirements for most of the functional budget areas of college and university operation based on objective (quantitative) data.

(b) Budget formulas have the potential for reducing the bickering and open competition among institutions for state funds which may occur in the absence of any other rational, objective means for allocating funds.

(c) Budget formulas have the potential for assuring each institution of an annual operating base appropriation--assuming that the legislature accepts the formula and that the base factors (e.g., FTE enrollments) do not decrease.

(d) Budget formulas provide state officials with a reasonably simple and understandable basis for deciding upon and presenting the financial requirements of higher education.

(e) Budget formulas represent a compromise between state control over line-item budgeting and institutional fiscal autonomy.

Although a number of advantages are inherent in the implementation of a state budget formula, such a mechanism is not without certain disadvantages. While the definition implies objectivity as a characteristic of the budget formula, the specification of the components and the relationships among the programs and costs reflects subjective decisions regarding the functions of institutions, the value and priorities of their programs, and the costs required to support these activities. In addition, standards for institutional operation may be set as a result of quantification which bear little relation to the central purposes of the institution. The difficulty here, as pointed out by Moss and Gaither (1976), is the attempt to substitute the process of measurement for that of evaluation. The important outputs of postsecondary institutions, such as new knowledge, development of critical intellectual skills, and increased imagination, cannot be effectively measured or evaluated on the basis of indices typically used in budget formulas: credit hours and student-faculty ratios. Finally, the structure of the formula, which includes certain components with specific relative weights and excludes others, reflects state policy priorities for program development. Any budget formula must be recognized as a simplified mechanism for deriving general estimates of future resource requirements, limited both in purpose and in content.

Gross (1973, pp. 197-98) has summarized some of the specific limitations advantages rather succinctly.

(a) Budget formulas do not recognize quality. This limitation will exist until the means for quantifying and measuring quality of instruction, research, and public service is developed.

(b) A budget formula is limited in its ability to estimate adequately the funding requirements for a given budget area by how well the formula (fixed) factors represent reality and the extent to which the base (variable) factors have a positive correlation to historical expenditures.

(c) Budget formulas, if used on an equalization basis, have a great potential for a "leveling" effect upon the quality of education. Whereas the educational programs in low-quality institutions may be improved through the increased funding realized when similar programs (e.g., the same instructional levels within the same academic areas) are funded at rates based on statewide average historical costs, it may be at the expense of the high-quality programs at the leading colleges and universities.

(d) Budget formulas have the potential for restricting the operating budgets of institutions by requiring the deduction of all unrestricted revenue in arriving at the state appropriation, by precluding the distribution of surplus state revenue to higher education, and by using a narrow base which does not adequately predict resource requirements.

(e) Budget formulas may perpetuate inadequate operating appropriations if the base or formula factors are selected on the basis of their existence at a point in time.

(f) Budget formulas, through their reliance upon base and formula factors, historical costs, and arbitrary assumptions, are an enticement for institutions to increase enrollments in specific categories or otherwise manipulate data in order to maximize their income.

Another difficulty pointed out by Halstead (1974, p. 665) is the insensitivity of formulas to the particular needs of new program initiatives. Often new programs, since they are not well established with growing or even stable enrollments, have difficulty competing for support. Budgeting procedures must address the particular needs of these programs and be flexible enough to provide the required support. These disadvantages become particularly apparent when the formulas become perceived as illegitimate by those concerned with their function. The caveat by Glenny (1959, p. 144) is pertinent here.

> Unless adequate research has preceded the establishment of the formula and unless review and necessary readjustments occur from time to time, formulas are certain to make a mockery of objectivity and experienced judgment.

2.2 Approaches of State Budget Formulas

The major purpose of a state budget formula is the estimation of the future financial requirements of an institution in support of its activities. Such activities include instruction, research, and public service among others, and a state budget formula is usually designed to address one activity at a time. For each activity, the budget formula may take one of two approaches: a total entitlement approach or a line item approach. Finally, given the approach selected for a specific activity, one of three methods can be used as the basis for the formula: staffing standard, workload, or percentage base. The following two sections present discussions relative to these basic components of a budget formula.

The institutional activities addressed in state budget formulas can be conveniently classified into categories, following the guidelines recently

published by the National Association of College and University Business Officers (1974):

1) instruction and departmental research;
2) organized research;
3) public service;
4) academic support;
5) student services;
6) institutional support;
7) operation and maintenance of physical plant; and
8) scholarships and fellowships

These categories correspond to the expenditure categories associated with educational and general expenditures from current funds. In the accounting practices of colleges and universities, current funds include the operating funds of the institution for educational and general purposes, as contrasted with the other special fund groups: loan funds, endowment and similar funds, annuity funds, plant funds, and agency funds. State budget formulas are designed to address or model the educational and general categories only. Auxiliary enterprises, such as the bookstore, housing, and food service, are usually self-supporting since these activities charge fees for their services which are to cover the expenses associated with the provision of the services, and therefore they are not included in a budget formula. In addition, expenses associated with the care of patients and general services of hospitals and those of independent operations, such as federally-funded research laboratories, are not considered as part of the budget formula.

In developing the budget formula for educational and general categories, two approaches can be used: total entitlement and line item. The major differences between these two approaches are the level of aggregation and the explicitness of the elements that make up the rate. In the total entitlement approach, a single rate is established for each major category of activity included in the formula (e.g. instruction and departmental research, academic support, etc.). This standard rate represents a composite of factors that contribute to the cost of a particular category. Louisiana and Tennessee, for example, derive budget estimates for instruction and departmental research on the basis of credit hour production and specific rates per credit hour. The rate incorporates all instructional costs, including faculty and staff salaries, equipment and supplies, and other operating expenses. Although the formula may differentiate rates among programs and levels, the total entitlement is derived as a single process. The support for instruction and departmental research, for example, is determined by multiplying the rates

by the number of credit hours. An alternative to this process is a line item approach, in which the budget formula addresses specific line items associated within each major category. For example, in developing the instruction and departmental research budget estimate proposed in Michigan, the category explicitly reflects line items associated with faculty salaries, staff salaries, and operating expenses as well as adjustments for anticipated credit hour increases and errors in projected credit hour production. Each of these individual line items has a specific formula for developing a budget estimate, and the entitlement for instructional activities is the sum of these individual line items.

While the total entitlement approach may appear more appealing because of its simplicity, it is not sensitive to fluctuating or differentiating aspects of the elements comprising the total expenses. The advantage of the line item approach is the increased sensitivity of the formula to the different factors comprising the activities within a functional category. The more sensitive the budget formula to the elements comprising a given category, the more precise, adequate, and equitable the funding estimate. Those engaged with the state budget process, including the institutions, the state education agency, and the legislature and governmental agency, would perceive a formula which increases precision, equity, and adequacy as more legitimate, thus facilitating the process. The problems, however, with the line item approach are the greater data requirements, the loss of flexibility in allocating funds within a major category, and the potential intrusion of political considerations into the budget process through detailed accountability. If the legislature limits the allocation of state funds to quite narrowly-defined purposes, institutions may be restricted too severely in the internal allocation of funds. The potential loss of institutional autonomy must be weighed against the advantages of increased sensitivity of the budget formula.

2.3 Methods Reflected in State Budget Formulas

Typically, a formula to define the total financial requirements of an institution is not a single formula, but rather a group of formulas, each reflecting specific component of the functional categories in the current funds group. As Halstead (1974, pp. 665-667) points out, these specific formulas can be categorized according to one of three methods of calculation: workload, staffing standard, or percentage base fact These same approaches are discussed by Gross (1973) and Moss and Gaither (1976), using a different terminology: rate per base factor (workload), base factor to position ratio

with salary rates (staffing standard), and percentage of base factor (percentage base factor). For simplicity and convenience, this study has adopted Halstead terminology.

In the workload method, a workload or effort measurement which is relevant to the activity category is determined, and costs per unit are derived. These costs per unit, typically based on historical cost studies, are then used to estimate the level of funding required to support a functional category, given a certain or expected number of units. The entitlement for library expenses, for example, could be based on the number of full-time Equivalent (FTE) students by student level since library costs are reasonably related to the number of students enrolled; specific dollar rates per FTE student by student level are then derived. An estimate for support dollars required is obtained by multiplying the projected number of FTE students by the derived rates. In the case of the operation and maintenance of the physical plant, the gross square footage of space assigned to educational and general purposes could be multiplied by a cost-rate per square foot, based on historical cost analysis. This approach requires careful assessment of costs and functional/cost relationships and requires the use of empirical and historical cost analysis.

The staffing standard formula determines the number of positions (faculty, administration, or staff) required for the major activity category and then multiplies this requirement by a corresponding salary schedule. Two approaches to deriving the number of required positions are generally used: 1) the desired ratio of positions to a specific workload measure is specified; or 2) an appropriate organizational structure and manning table is developed. As an example of the first method, the amount of support for faculty is developed by deriving the number of faculty members required by dividing the number of projected credit hours expected to be generated by an average number of credit hours expected per faculty member. This number of required faculty is then multiplied by a standard or average salary to determine the total resource requirements for faculty salaries. The number of staff positions required might then be derived based on the number of faculty positions: for example, one staff member per every four faculty members. This derived number of staff positions is then multiplied by a standard or average salary per position to obtain the financial requirements for instructional support personnel. Other examples of this approach might be the specification of student-faculty ratios or the number of square feet per custodian. When a manning table approach is taken, the organizational structure of the institution is specified, and the number

of positions permitted for each level is given. For example, the formula might specify that each instructional center or school is allowed one dean, one associate dean, and two research assistants. Salary rates for each of these positions would be given, and the entitlement would be determined by multiplying the number of positions by the appropriate salary rate.

Expenditure estimates derived from a percentage base factor approach specifies that the amount budgeted for a given category shall be a certain percentage of a base activity. The base activity entitlement, such as instruction and departmental research, is typically developed by either the workload or the staffing standard method. A percentage of this entitlement is then determined as the support requirement for a second activity. As an example, given a base entitlement for instruction, academic support funding requirements may be specified as 5% of the base.

While each of these approaches can be used in the development of a state budget formula and examples of all can be found, each has associated with it limitations and advantages which must be considered in developing and implementing a budget formula. The workload formula approach is the one that Halstead (1974) identifies as the most preferred. Its major advantage is that it can accommodate programmatic and other cost variations without bringing the specific factors to the forefront of the budget formula (Wisconsin Policy Paper #2.1, 1976). Typically in this mode the specified rate per credit hour or per student will incorporate factors such as average credit hour production per faculty and the ratio of staff personnel to faculty, but the components are not made explicit. Tennessee's instruction and academic support formula provides an example. It includes faculty and clerical salaries, office expense and equipment, and other instructional department expenses, but summarizes these expenses into a single cost per credit hour figure. Similarly, costs per square foot in a formula for custodial services reflect an implicit staffing standard on the amount of space a custodian should manage without it being made explicit. While this approach is attractive in its handling of potential political difficulties, its disadvantage is that it reflects past behavior by basing the rates on historical cost patterns and may either perpetuate poor resource management or understate costs in an inflationary period. Fluctuations in cost components will affect the accuracy of projected fiscal requirements. The workload approach also requires a careful and frequent monitoring of the cost per unit and an adequate data system.

As pointed out in the Wisconsin Policy Paper #1.1 (1976), two difficulties are encountered with the staffing standard approach. The specification of the average number of credit hours per faculty member by discipline and teaching level or instructional method tend to constrain and distort academic judgments about the appropriate teaching modes to meet particular needs. As an illustration, the formula may specify that the average number of lecture credit hours per faculty member is 300 and for independent study and thesis and dissertation guidance, 200. In a sense this formula could reinforce independent study and guidance as an instructional mode, even though in many instructional situations it is not the most appropriate mode to be employed. Further, such an approach is subject to manipulation both by the institution and the legislature. The institutions may begin to offer more credits of independent study, so to increase the number of faculty positions to be funded and thereby their share of the appropriation. On the legislative side, these staffing standards become bargaining points in the context of the budget, which could result in increasing, rather than reducing, the political uncertainties of the state budget process.

Of the three approaches, the base factor approach appears to be the most simplistic. It forces attention to the central considerations related to direct instructional costs, and budget officers and legislators may find this more simple approach easier in building the budget. It is, however, based on a major assumption that the relative cost of the budget component being derived are reasonably constant and predictable. If not, the simple percentage will not be adequate as a method for deriving future costs. For example, the costs associated with library periodical subscriptions may be increasing at a rate which changes the nature of the percentage relationship to instructional expenditures. The formula could then become inadequate in its ability to provide support. This approach also does not focus attention on the component as an area for the development or refinement of policy. If the budget formula is to function as an instrument for addressing policy issues, those components associated with the issues should be incorporated into the formula. Moreover, such an approach may provide little incentive to better management of resources in support areas.

2.4 Fixed, Variable, and Mixed Costs

Since the budget formula is designed to estimate future expenditures, it is necessarily linked to the analysis of cost behaviors (Robinson, Hay, and Turk, 1977). Therefore, attention should be given to whether the formula

addresses variable, fixed, or mixed costs and in what manner they are addressed. The accuracy of the budget estimate will be contingent upon the sensitivity of the formula to the particular cost behavior of the activity being modeled.

Variable costs are those which fluctuate in a proportional relationship to changes in the volume of the component. As the number of units increase, the total cost of that component increases correspondingly. Entitlements for instruction and departmental research are often treated in budget formulas as if they were variable costs. As shown in Figure 1, the entitlement increases as the number of credit hours increase.

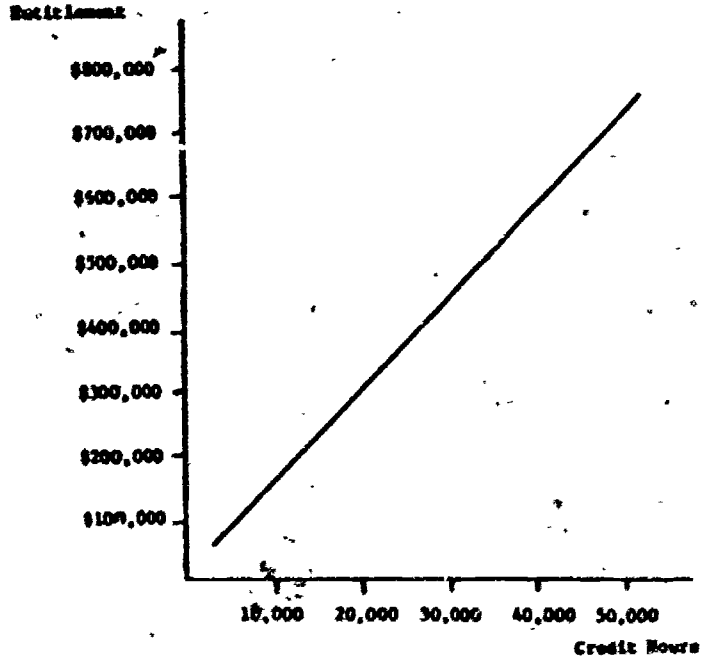

Figure 1. Variable Cost - Instructional and Departmental Research

Fixed costs, on the other hand, remain constant regardless of the changes in the volume of the component. Typically, fixed costs represent costs which are necessary to provide a service and are often referred to as "capacity costs." Within the context of budget formulas, few examples of a fixed cost approach are usually found. In the formula proposed by Michigan for the broadcasting component of public service, institutions which engage in such activities are entitled to fixed amounts for radio and television productions, regardless of any other factors. The costs of central administration (e.g. the chief executive and his principal staff officers) are sometimes viewed as fixed costs, since the member of such positions bears little relation to the overall size of the institution.

Finally, mixed costs are composed of both fixed and variable costs. In formula budgeting the representation of mixed costs entails a base amount for the entitlement (a fixed amount) plus an additional amount based on the level of the component. For example, the formula for public service may specify a base of $25,000 to which is added an amount based on the credit hour production. Figure 2 provides a graph of this mixed cost. As shown in this example, a base entitlement of $25,000 is provided for public service activities regardless of continuing education unit (CEU) production. If the institution produced 2,501 to 7,500 CEU, then an additional $25,000 is provided, and so on up to a maximum of $100,000 for 2,500 CEU and above. When a staffing standard, rather than the workload, method is used to estimate mixed costs, a fixed number of positions is provided to which a variable number of positions is added contingent upon the number of faculty or the number of students.

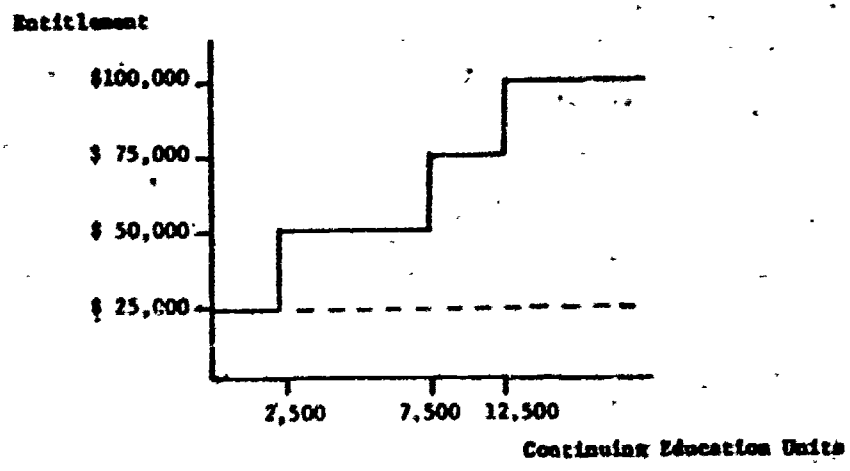

Figure 2. Mixed Costs - Public Service

2.5 Projection of Costing Units

Halstead (1974) suggests that the basic structure of budget formulas involves the multiplication of unit costs by projected loads, or volume, to estimate the future fiscal requirements. Some states, however, have implemented procedures which base the budget projection on the current fiscal year's actual performance. The question is whether to base the budget on a projection of the forthcoming headcount and/or full-time equivalent enrollment, credit hour production, and other volume related cost units, or to use as the base for budget calculations the most current, actual levels of the particular cost units.

The difficulty with basing the amount on projected estimates is associated necessarily with that of accuracy. Specifically, if the budgeting process is based on projected figures only, it must make provisions for the situation in which an institution exceeds its projection or in which it does not meet its projection. New Mexico's budget process, which is based on a projection approach, has considered the problem of institutions exceeding enrollments by making a provision of $200,000 to meet the costs of additional students. It does not, however, propose to recoup funds from institutions not meeting the projected enrollments, one possible solution to this problem. The proposed budget formula in Michigan has incorporated a factor based on previously projected credit hours and audited credit hours for that period. An adjustment in the upcoming budget period is then made on the basis of ratio of projected and audited credit hours.

Instead of basing the budget requests on projected units, an alternative is to use actual levels of the respective units for the most recent fiscal period. The state budget processes in Texas and Louisiana provide two examples of this approach. While this process eliminates the problem of over-estimates, it reflects a philosophy which can be described as "looking backward into the future." Under this approach changes in the unit, whether expected or unexpected, are not addressed until the next budget period, which may be too late to meet real resource needs, especially in a period of rising enrollments. On the other hand, such a technique will provide an opportunity for phased reductions in funding in a period of declining enrollments.

2.6 Incorporation of Inflation Factors

Inflation, as a factor which significantly influences the operating budgets of institutions, can and should be incorporated into the budget formula. The manner of incorporation is contingent on the approach and method used in the particular formula. One possible approach is to use an overall percentage factor for inflation in a specific activity category. Oklahoma's fiscal year 1978 budget formula for the health areas, for example, provides for a 7% increase in both general administration and general expense and a 10% increase in continuing education and in organized research. A formula which uses the percentage base method would necessarily be restricted to this overall percentage for inflation. When, as Alabama's formula does, the academic support entitlement is defined as 5% of the instruction and departmental research budget, inflation can be incorporated into the estimate either by adding

on a percentage for inflation in each specific category or to assume that the inflation factors incorporated into the instruction and departmental research estimate will be sufficient to cover the inflationary costs in academic support activities.

The latter procedure, while simple to apply, may not be sensitive to the differential impact of inflation on specific components within the formula. Where the formula was either the staffing standard or workload method, an alternative is to adjust the specific salary rates or rates per unit differentially. Thus, if the formula delineated faculty and staff salaries separately, as do the Michigan, Texas, and Virginia budget formulas, different inflationary rates could be applied to each salary category: 6.5% for faculty and 7.5% for staff, as an example. Similar situations occur in non-salary items, as with the grounds maintenance formula in Washington, where the acres of land being maintained are categorized as four types with different rates for each type. If the costs associated with maintaining lawns were increasing faster than those associated with paved areas, the differential application of inflationary factors could be readily incorporated. Another situation is where specific rates per student are used. To incorporate inflation the rates could be adjusted either on an across-the-board manner (all rates increase by 7.0%), or differentially (i.e. different inflation factors are associated with different programs and/or levels).

How inflationary factors are incorporated into the budget formula will depend to a large extent on the design and structure of the formula. It will also depend on the political process and the extent to which the specific factors will become negotiable items. One of the purposes or functions of budget formulas is to reduce the political uncertainties of the state budget process. By increasing the sensitivity of the formula and incorporating specific inflationary rates, the result may be counterproductive to that purpose.

3.0 REVIEW OF SELECTED STATE BUDGET FORMULAS

The budget formulas of the ten selected states provide diverse examples of the approaches, methods, and components used in estimating institutional fiscal requirements. The budget formulas are examined in terms of the eight major categories of institutional activity, following the framework provided by the National Association of College and University Business Officers (1974) for Educational and General Expenditures. In addition, two areas of special adjustments, and the application of formulas to health-related activities are considered. Specifically, this examination classifies each formula relative to: 1) general approach (total entitlement or line item); 2) method of calculation (staffing standard, workload, or percentage base); and 3) major components (the specific variables addressed in the formula). Table 2 summarizes the categories addressed in this section, noting which categories are included in each state budget formula. Appendix A contains a written description and a mathematical representation of each of the ten state budget formulas.

3.1 Instruction and Departmental Research

Expenditures in this category typically include the expenses for activities which are part of the institution's instructional program, except for remedial and tutorial instruction which is classified under Student Services. Departmental research does not include separately budgeted sponsored research, which is classified as a research activity. While the costs and activities associated with the department chairman are included, dean's offices, however, are usually excluded from this category. Table 3 summarizes the approaches taken by the states and the components included in their formulas.

The budget formula for Oklahoma institutions is based on an historic rate per FTE student, differentiated by discipline and level, and projected FTE enrollment. That portion of the rate associated with instruction is developed using standard student-faculty ratios, differentiated by level, and institution type and standard faculty salaries by institution type. The

Table 2

Summary of State Budget Formulas by Category

	Instruction	General Support	Research	Public Service	Academic Support	Libraries	Student Services	Institutional Support	Operation and Maintenance	Adjustments	Health Areas
Alabama	X		X	X	X	X	X	X	X	X	X
Louisiana	X	X									
Michigan	X		X	X	X	X	X	X	X	X	
New Mexico	X	X								X	
Ohio	X				X		X	X	X	X	X
Oklahoma	X	X								X	X
Tennessee	X		X	X	X	X	X	X	X	X	
Texas	X		X	X		X	X	X	X		
Virginia	X				X	X	X	X	X		
Washington	X					X	X		X		

remaining portions per student implicitly incorporates expenditures related to general instructional support, including library, general administration, general expense, and operation and maintenance, of physical plant and is based on each individual institution's cost history.

Two states, Louisiana and Tennessee, use a budget formula approach which estimates the total instructional cost. Both state formulas are based on credit hour production and specific rates per credit hour; the number of credit hours is multiplied by the specific rate per credit hour. The essential difference is that Louisiana's formula considers a base year credit hour production, while Tennessee's uses projected credit hours. Both formulas differentiate the credit hours and the rates on two factors: program or academic area and level, such as lower level undergraduate, upper level undergraduate, master's, doctoral.

Among the remaining seven formulas, six separate line items are used: instructional faculty salaries, administrative faculty salaries, staff salaries, and other operating expenses, instructional administration, and credit hour

Table X

Instruction and Departmental Research

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage
Base Credit Hours		Louisiana	
Budgeted Credit Hours		Tennessee	
Rate per Unit		Louisiana Tennessee	

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Instructional Faculty Salaries			
Projected FTE Enrollment	Ohio Oklahoma Virginia		
Base FTE Enrollment	Texas		
Student-Faculty Ratio	Ohio Oklahoma Texas Virginia		
Projected Credit Hours	Michigan New Mexico Washington		
Credit Load per Faculty	Michigan New Mexico Washington		
Standard Average Salary	Michigan Ohio Oklahoma Texas		
Institutional Average Salary	New Mexico Virginia Washington		
Administrative Faculty Salaries			
FTE Instructional Positions	Virginia		
Institutional Average Salary	Virginia		
Staff Salaries			
FTE Academic Positions	Michigan Virginia		
FTE Administrative Positions	Virginia		
Standard Average Salary	Michigan		
Institutional Average Salary	Virginia		
Other Operating Expenses			
Projected Credit Hours		New Mexico	
Base Credit Hours		Texas	
Projected FTE Enrollment		Ohio	
Rates per Unit		New Mexico Ohio Texas	
Previous Budget Amount			Washington
Total Instruction Compensation			Michigan
Credit Hour Estimates			
Audited Base Credit Hours			Michigan
Projected Base Credit Hours			Michigan
Faculty and Staff Salaries			Michigan
Operating Expenses			Michigan
Instructional Administration			
Level Weight			Texas
Credit Hour Weight			Texas
Instructional Faculty Salaries			Texas

estimates. These budget formulas consider the various line items separately and derive the total entitlement by summing the component costs.

As shown in Table 3, when salaries are separated as distinct line items, the method used in developing the formula is the staffing standard. For the computation of instructional faculty salaries, the number of positions to be funded is determined 1) by dividing either projected or base year FTE enrollment by student-faculty ratios or 2) by dividing either projected or base year credit hours by specified credit loads per faculty. The budget formulas of Ohio, Texas, and Virginia use FTE enrollments and student-faculty ratios, while those of Michigan, New Mexico, and Washington use credit hours and credit loads per faculty. To obtain the estimated funds required, the number of derived positions is then multiplied by an average salary, either an institutional average or a statewide standard salary rate, as shown in Table 3. Regardless of whether FTE enrollments or credit hours is the variable base used, the budget formulas typically differentiate the enrollments or credit hours by program or academic area and by level of instruction or student. Ohio's method provides a notable variation; areas have been grouped into levels on the basis of similar historic costs. For example, the program of General Studies has three levels with the areas of History, Geography, and Home Economics grouped into Level I; English, Biological Sciences, and Library Science, into Level II; and Chemistry, Physical Education, and Drama and Dance into Level III. Student-faculty ratios are also differentiated by program and by level, so that the number of faculty positions is determined for each program/level combination. The total number of positions is then summed and multiplied by the particular salary rate.

The budget formula of Virginia and that proposed for Michigan also include other salary line items under instruction and departmental research. Administrative and staff salaries are both included as components in Virginia's formula, while Michigan includes only the staff salary component. The number of administrative positions is a function of the number of FTE instructional faculty positions, and the salary entitlement is derived by multiplying the number of positions by an institutional average salary. The number of staff positions is a function of both the number of instructional faculty positions and the number of administrative positions in the Virginia formula, while in the proposed Michigan formula, it is derived from the number of FTE instructional positions. The staff salary entitlement is determined by multiplying the number of positions by either an institutional average salary (Virginia) or a standard salary rate (Michigan).

Other operating expense entitlements for instruction and departmental research are determined by either the workload formula method or the percentage base formula method. Historic rates, or costs, per unit are developed for the operating expenses. The magnitude of these rates depend on whether the cost unit is enrollment or credit hour, as well as what costs are included in the definition and the extent of differentiation by program and level. These factors make interstate comparisons of cost rates difficult. Ohio, New Mexico, and Texas provide examples of the workload method for developing the operating expenses budget. Ohio's formula is based on projected FTE enrollment, while New Mexico's (projected) and Texas' (base year) formulas are based on credit hours. As an alternative to the workload method, Washington's budget formula determines the operating expenses as a percentage of the previously budgeted amount, so as to adjust incrementally for inflation. This budget approach reflects an assumption that changes in any portion of the budget will not affect departmental operating expenses. As a second example, the proposed Michigan budget formula specifies that the departmental operating expenses reflect a percentage of the total instructional compensation amount, including both faculty and staff salaries thereby providing a partial adjustment for inflation.

Michigan's proposed formula for instruction and departmental research, which is based on projected credit hours, also provides a correction for an error in estimating the actual credit hour production. The ratio of the audited to the projected credit hours is multiplied by faculty and staff salary and operating expenses entitlements, thus making a percentage adjustment to the budgeted amount for either over- or under-estimates of projected credit hour production. While other states use projected enrollments or credit hours, Michigan's proposed formula is the only one with such a correction factor. In the budget process for New Mexico, funds are set aside statewide to cover additional expenses when enrollments exceed the projected level, although the problem of underestimation is not addressed.

Finally, the Texas budget formula includes a line item for instructional administration (Dean's offices), which is based on three factors: a weight for level of instruction, a weight for credit hour production, and faculty salaries. The level weight formula reflects a posture that instructional administration is most affected by the undergraduate and the professional levels and very little by the master's and doctoral levels. The credit hour weight formula recognizes that institutional size, as indicated by credit

hour production, is important to this cost and provides higher weights to credit hour production in excess of specified levels. Finally, the entitlement for instructional administration is determined by applying these weights to the faculty salaries entitlement, a function of the number of faculty positions.

The activities associated with instruction and departmental research receive the largest share of the educational budget. The costs associated with these activities include faculty, administrative, and staff salaries; materials and supplies; equipment; and other operating expenses. In deriving budget estimates for this category, both the total entitlement and the line item approach are represented in the budget formulas reviewed. When the total entitlement approach is taken, the formula uses the workload method. Credit hours are multiplied by specific rates per credit hour, where the rates encompass the total costs associated with instruction and departmental research into a single number differentiated by program area and level. When the line item approach is taken, salaries or compensation are one set of considerations, and other operating expenses are a second area. With salaries as a line item, the staffing standard method is the rule, where the number of required positions is multiplied by specific salary rates. Support for other operating expenses is derived using either a workload method or a percentage base method. Adjustments for over- or under-projection of the units are also of concern and are addressed explicitly by one of the formulas reviewed.

3.2 General Support

The budget formulas of Louisiana, New Mexico, and Oklahoma provide for general support for the institutions beyond that specifically for instruction. Table 4 summarizes the components and methods used in the formulas. Both Louisiana and New Mexico derive the entitlement for general support as percentages of the instruction and departmental research entitlement. The Louisiana formula derives an estimate for the instructional salary base. It then takes the position that the state should support 73% of the total educational and general needs of institutions and faculty salaries should reflect 66% of these total expenditures. Given these two assumptions, the amount for general support is then determined to be 62.65% of the derived instructional salary base. The total institutional entitlement is the salary base plus 62.65% of that salary base. Algebraically, this figure is equivalent to the 73% for state support. In a similar manner, the New Mexico formula specifies that for large

institutions general support should reflect 44% of the total educational and general expenditures and for small institutions, 45%. In contrast to the percentage method, Oklahoma's budget formula has determined historic costs per FTE enrollment and developed a general support entitlement by multiplying the projected FTE enrollment by the rate per student. These rates are differentiated by program and level.

Table 4

General Support

Total Entitlement Approach

Unit/Component	Method of Calculation		
	Staffing Standard	Workload	Percentage base
Instruction Entitlement			Louisiana New Mexico
Projected FTE Enrollment		Oklahoma	
Rate per Unit		Oklahoma	

3.3 Research

Funds supporting organized research activities, whether commissioned by an external agency or sponsored by the institution, are categorized as research following current accounting practices (NACUBO, 1974). The distinguishing characteristic between this category and that of instruction and departmental research is that these research activities are separately budgeted. Typically such expenditures are funded by the state on a project grant basis and, therefore, are not usually included in the formula budget. Several states, however, do provide for research support as part of the formula. As shown in Table 5, when the total entitlement approach is taken, the method used by Alabama, Tennessee, and Texas was a percentage of a specified base. In Alabama's formula, 2% of the instruction and departmental research entitlement is for research. Tennessee's budget procedure sets aside $1,500,000 for research support to be divided among the institutions. If an institution secured external funds in excess of $5,000 either from private or governmental sources for research during the base year period, then a percentage of these funds based on the institution's proportion to the total state amount of sponsored research funds secured during the base year, is distributed to the respective institutions. The Texas budget formula for organized research includes 5% of the sponsored research funds secured by an institution from external sources.

Table 5

Research

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Instruction Entitlement			Alabama
Institutional Sponsored Research Funds			Tennessee Texas
Statewide Total Sponsored Research Funds			Tennessee
Base FTE Student Enrollment			Texas
Faculty Salaries			Texas

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Research Base			
Base FTE Faculty	Michigan		
Standard Average Salary	Michigan		
Research Capacity			
Non-General Fund Research Funds			Michigan
Research Institutes			
Base Budget Expenditure			Michigan
Program Changes			Michigan

In addition, the amount determined for faculty salaries is multiplied by an institutional complexity factor. This complexity factor is based on the FTE enrollments by level, and to some extent, program area. Undergraduate enrollment is weighted as a low factor in its contribution to the complexity of the institution. Master's level enrollment is weighted so that it contributes slightly more, and the weights are differentiated by program. The largest factor contributing to institutional complexity, as defined in this formula, is doctoral level enrollment, which is also weighted by program. The entitlement for organized research under the Texas formula is then 70% of the weighted faculty salary amount and the percentage for the base year sponsored research expenditure.

Using a line item approach, the Michigan budget formula incorporates three formula items: research base, research capacity, and research institutes. In addition, institutions can be awarded special project grants, and changes to existing project grants are included but neither as a formula-derived line item; the institution projects and justifies this amount. Of the formula derived line-items, the research base is developed using the staffing standard method; 2% of a base year FTE faculty positions supported by state general funds is multiplied by the average statewide faculty salary rate for that base period. Research capacity is derived as a percentage of the non-general fund research expenditures. State-sponsored research institutes, according to the formula, maintain a base amount and receive a percentage increase, plus funds to support justifiable program increases.

By making the provision for sponsored or organized research as part of the budget formula, these states recognize that research is an integral part of the mission of postsecondary institutions, and they are willing to support, at least in part, these activities. The Texas and Michigan formulas, in particular, reinforce those institutions which have obtained outside funding. Since the acquisition of external funds requires that faculty utilize their time and institutional resources in the preparation and submission of proposals, the posture of these states is one which provides incentives for externally funded sponsored research.

3.4 Public Service

Public service activities of postsecondary institutions involve noninstructional programs provided to the community and cooperative extension services. Conferences, institutes, radio and television, consulting, and reference bureaus are examples. Of the four state budget formulas which explicitly addressed

the public service category, three--Alabama, Tennessee, and Texas--use the total entitlement approach, as shown in Table 6. The Continuing Education Unit provides the costing unit in the budget formulas of Tennessee and Texas, although the rates are determined differently. In the Tennessee formula, four ranges of continuing education units are given, and a fixed amount is associated with each range. In the Texas formula, the rate is $10 per continuing education unit. Both formulas, however, provide a minimum of $25,000 and a maximum of either $100,000 (Tennessee) or $200,000 (Texas). The Alabama budget formula provides for 2% of the instruction entitlement to be for public service activities.

Michigan's proposed budget formula takes a line item approach, including components representing continuing education, broadcast, past performance, service area, delivery capacity, and state-sponsored institutes. Continuing education in the formula is shown as a function of the expenditures for academic support and credit hours for a base period. (Academic support expenditures reflect funds expended for those activities which support the missions of instruction, research, and public service, such as libraries and museums; demonstration schools; audio-visual services and computing support; academic administration; and curriculum development.) The formula provides an historic academic support rate per credit hour and then multiplies this rate by a base period number of continuing education units. The entitlement for broadcasting activities is based on fixed amounts of $460,000 for CPB television, $118,000 for CPB radio, and $25,000 for non-CPB radio. In determining the entitlement for past performance, 50% of the total investment for continuing education and broadcasting is multiplied by the proportion of the statewide expenditures for public service spent by the institution. Service area entitlement is based on 12.5% of the total for continuing education and broadcasting and the percentage of the population served by the institution. Delivery capacity also is developed from the total for continuing education and broadcasting; 37.5% of this total is multiplied by the percentage of the total FTE students associated with public service activities. As a non-formula item, estimates for state-sponsored institutes' budgets are based on institutional justification. Finally, the state's estimate of the total public service entitlement is 6.5% of the sum of these line items.

3.5 Academic Support and Libraries

Academic support activities include service provided by the institution to meet the missions of instruction, research, and public service. A major

Table 6

Public Service

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Base Continuing Education Units		Tennessee Texas	
Instructional Entitlement			Alabama

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Continuing Education			
Base Period Academic Support Expenditure		Michigan	
Base Period Credit Hours		Michigan	
Continuing Education Units		Michigan	
Broadcase			
Fixed Amount			Michigan
Past Performance			
Continuing Education Entitlement			Michigan
Broadcast Entitlement			Michigan
Institutional Funds for Service			Michigan
Statewide Funds for Service			Michigan
Service Area			
Continuing Education			Michigan
Broadcast			Michigan
Percent of Population Served			Michigan
Delivery Capacity			
Continuing Education			Michigan
Broadcast			Michigan
Percent of FTE Students			Michigan

category in this area is the cost of the libraries, and many of the state budget formulas address libraries as a separate category, rather than including it in academic support. Academic support typically includes costs associated with museums and galleries; demonstration schools; media and technology, such as audio-visual services and computing support; academic administration and personnel development; and separately budgeted support for course and curriculum development. While several states have separate formulas for both academic support and libraries (Alabama, Tennessee, and Virginia), others address only the library category (Texas and Washington) or total academic support (Ohio). Michigan's budget formula contains academic support as a formula item and libraries as a non-formula item.

Table 7 presents a summary of the approaches and methods used by the selected states for the category of academic support. Three of the state budget formulas consider academic support as a percentage of the instructional entitlement: Alabama - 5%, Tennessee - 8%, and Michigan - 25%. Ohio's budget formula reflects a cost per FTE student basis which is delineated by program area and level and includes library support as well. Virginia's budget formula utilizes a staffing standard approach where the number of positions to be distributed among the various programs is a function of the number of instructional and administrative faculty positions. Under the Virginia methodology, a distinction is made between the staffing needs of doctoral-granting universities and those of comprehensive colleges, liberal arts colleges, and specialized institutions. For example, the ratio of FTE instructional faculty positions to administrative positions is 20 to 1 for doctoral-granting universities and 35 to 1 for the other institutions. The number of derived positions is then multiplied by an institutional average salary to obtain the academic support entitlement.

The budget formulas of Alabama, Tennessee, and Texas each approach the library funding in terms of total entitlement. As shown in Table 8, in all three cases, the amount is based on credit hours and specified rates per credit hour. Tennessee and Alabama use projected credit hours, while Texas uses a base period production. All three, however, take into account level; Tennessee distinguishes between lower level and upper level undergraduate, while Alabama and Texas consider one level of undergraduate. Texas also recognizes a category labeled "special professional." The rates per credit hour necessarily differ, but in general reflect that larger costs are associated with the more advanced levels.

Table 7

Academic Support

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Instruction Entitlement			Alabama Michigan Tennessee
Projected FTE Enrollment		Ohio	
Rate Per Unit		Ohio	
FTE Instructional Faculty	Virginia		
FTE Administrative Faculty	Virginia		
Institutional Average Salary	Virginia		

As an alternative to the total entitlement approach, the library budget formulas of Virginia and Washington reflect distinct line items by including staffing salaries and library maintenance with Washington also including binding. With regard to staffing needs, both state budget formulas provide for a minimum of FTE staff positions to which are added positions as related to FTE enrollment and FTE faculty positions. The enrollment factor is delineated by level in both formulas and reflects a differential weighting of the enrollment depending on level. With regard to faculty positions, Virginia's formula not only includes it as a factor but also differentiates between doctoral-granting institutions and the comprehensive colleges, liberal arts colleges, and specialized institutions. In addition to enrollment and faculty factors, the Washington formula, as recommended, also takes into account the number of FTE staff, a weight for maintenance of the current collection, and a weight for new acquisitions. From these factors the number of required positions is derived, and the library staffing salary entitlement is computed by multiplying this number by either an institutional salary rate (Virginia) or a standard amount (Washington).

For library maintenance, the approach taken in the recommended Washington formula and in the Virginia formula for doctoral-granting institutions meets the Association of Research Libraries membership criteria (The Voight Formula) by determining the number of volumes and multiplying this by a standard rate per volume. In both formulas, determination of the number of volumes takes

Table 8

Libraries

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Base Credit Hours		Texas	
Projected Credit Hours		Alabama Tennessee	
Level		Alabama Tennessee Texas	
Rate per Unit		Alabama Tennessee Texas	

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Staffing Salaries			
Fixed Positions	Virginia Washington		
Base FTE Students by Level	Virginia Washington		
Instruction FTE Faculty	Virginia Washington		
FTE Salary	Washington		
Current Collections	Washington		
New Acquisitions	Washington		
Institutional Salary	Virginia		
Standard Salary	Washington		
Library Maintenance			
Number of Volumes		Virginia Washington	
Rate per Unit		Virginia Washington	
Program		Virginia	
Level		Virginia	
Number of Programs		Virginia	
Fixed Entitlement		Virginia	
FTE Students by Level		Virginia	
Binding			
Current Subscriptions		Washington	
Weight for Rebinding		Washington	
Standard Dollar Value		Washington	

into account several factors: a volume base; program additions by area; and sponsored research adjustments. The Washington formula also addresses changes in student enrollment, faculty changes, and a replacement adjustment. For all other institutions in Virginia, the Virginia Maintenance Formula is used. This formula provides a fixed entitlement which is modified by total program, program magnitude, and enrollment weights. The total program weight is derived from weights assigned to program areas and attributed to the institution, contingent on its unique program offerings at the undergraduate, master's and doctoral levels. The program magnitude weight is based on the number of authorized programs offered at each level. The enrollment is also weighted to differentiate among the levels which is then divided by the unweighted enrollment to derive the enrollment weight. The library entitlement under the Virginia Maintenance Formula is then found by multiplying these three weights by the fixed base amount.

As a final consideration to the library budget formula, Washington includes a separate line item for binding. This formula takes in account the current subscription rate, which is multiplied by a rate of 1.2 to allow for binding and rebinding. The resulting weighted subscription rate is then multiplied by a standard dollar amount to obtain the entitlement for binding.

3.6 Student Services

Student services activities include those associated with admissions and registrar offices, as well as those organizations which contribute to the student's emotional and physical well-being and to his intellectual, social, and cultural development outside the context of the formal instructional program. As shown in Table 9, while most states addressed student services as a distinct category and utilized the total entitlement approach, the Virginia budget formula takes a line-item approach. Virginia derives the amount for student services on the basis of required positions and institutional average salaries. Administrative positions, given a fixed number of 2 FTE positions, are a function of the number of FTE enrollment (2.75 per 1000 students), while support staff positions are based on the number of FTE instructional faculty (22.50 per 100 faculty).

The remaining budget formulas for the most part, view student services as a function of enrollment. Alabama, Michigan, Tennessee, Texas, and Washington use a headcount enrollment, while the Ohio formula uses FTE enrollment, but all compute a rate per student. Differentiation on the rate per student occurs

Table 9

Student Services

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Admission Applications		Washington	
Beds in Residency Halls		Washington	
Active Placement Files		Washington	
Projected Credit Hours		Michigan	
FTE Enrollment		Ohio	
Headcount Students		Alabama Michigan Tennessee Texas Washington	
Rate per Unit		Alabama Ohio Michigan Tennessee Texas Washington	
Base Amount for Sponsored Research			Texas
Base E & G Funds*			Texas

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Administrative Positions			
Fixed Number of Positions	Virginia		
Base FTE Students	Virginia		
Instructional Average Salary	Virginia		
Classified Staff Positions			
Fixed Number of Positions	Virginia		
FTE Instructional Faculty	Virginia		
Institutional Average Salary	Virginia		

*Exclusive of an amount for General Administration and Student Services.

either in terms of institutional size (Alabama and Texas) or by program (Ohio) or by level (Washington). In addition to headcount enrollment, Michigan also includes a fixed rate per credit hour. Washington's recommended formula includes factors in addition to enrollment: admission applications, beds in residence halls, and active placement files, each with fixed rates.

Since the Texas formula is designed to reflect not only student services but also general administration, it includes two factors not directly associated with student services. One factor is associated with the administration of sponsored research, where 5.7% of the base year sponsored research funds is included as part of the entitlement. The second factor included in the Texas formula is 1% of the base period amount for Educational and General Expenditures, exclusive of the amount for General Administration and Student Services.

3.7 Institutional Support

This functional category includes the central management and long-range planning for the entire institution; fiscal operations; administrative data processing; space management; employee and personnel records; logistical services such as procurement, security, printing, and transportation; support services for faculty and staff which are not auxiliary enterprises; and community and alumni relations. Table 10 summarizes the approaches and components addressed by the various state budget formulas.

In terms of the total entitlement approach, the budget formulas of both Ohio and Texas use the workload method to calculate institutional support. Ohio's formula, however, is based on projected FTE enrollment, while the Texas formula considers base period credit hours. In the Ohio formula, the rates per student are differentiated by program and level and are based on institutionally defined, historic costs. The rates per credit hour are standard and do not reflect program or level but rather are differentiated on the basis of amount of credit hours. The first 200,000 credit hours are costed at $1.02 and the rate progresses within ranges until amounts of credit hours over 600,000 are costed at $1.39. A minimum of $110,000 is also provided in the Texas formula as a base for all institutions.

In Alabama's entitlement for institutional support, 2% of the total formula derived entitlement, including operation and maintenance of physical plant but excepting utilities, represents the recommended amount. Tennessee's method for estimating the entitlement for institutional support considers

Table 10

Institutional Support

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Projected FTE Enrollment		Ohio	
Base Credit Hours		Texas	
Rate per Unit		Ohio Texas	
Fixed Entitlement		Texas	Tennessee
Total Formula Entitlement			Alabama Tennessee
Total Non-formula Entitlement			Tennessee
Base Year State Fund Expenditures			Michigan

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Classified Staff Positions			
Fixed Number of Positions	Virginia		
FTE Instructional Faculty	Virginia		
Institutional Average Salary	Virginia		
Administrative Positions			
Fixed Number of Positions	Virginia		
Base FTE Enrollment	Virginia		
Institutional Average Salary	Virginia		

the total of formula and non-formula expenditures, excluding that for institutional support. Given this amount, one of four formulas is applied depending on the amount and attempting to reflect institutional size. Michigan's proposed formula for institutional support was derived from a regression analysis and takes into account general fund expenditures, exclusive of institutional support and research agencies. Each of the remaining formulas essentially follows this same computational procedure, although the particular values of the percentages change, contingent on the total amount, and fixed entitlements are incorporated to adjust for institutional size.

Although the Virginia formula incorporates two separate line items: 1) executive management, fiscal operations, general administrative service, and public relations and development, and 2) administrative data processing, the distinguishing attributes of the line items are related to the type of position being considered. For both line items, the number of classified staff positions is computed on the basis of a fixed number of positions and the number of FTE instructional faculty. Administrative positions for executive management activities are differentiated by the type of institution (doctoral granting versus comprehensive colleges, liberal arts colleges, and specialized institutions) and are based on a fixed number plus additional positions depending on the number of FTE enrollments. For the data processing line item the the number of administrative positions is based on a fixed base and an additional number at a rate of positions per FTE students. Once the number of positions is determined, the entitlement amount is the number of positions multiplied by an institutional average salary.

3.8 Operation and Maintenance of Physical Plant

The activities associated with this category include operations, services, and maintenance related to grounds and facilities, as well as the expenses related to utilities, fire protection, and property insurance. Table 11 summarizes, according to approach, the methods and components used by those states surveyed which addressed this category. Applying the total entitlement approach, both the Ohio and Michigan budget formulas consider the operation and maintenance of physical plant on the basis of a rate per unit. Ohio's formula is based on projected FTE student enrollment, and the specific rates per student are differentiated by program area and student level. Michigan's formula is based on a fixed rate ($1.65) per gross square footage, plus a fixed entitlement ($225,000 plus an amount to offset inflation).

Table 11

Operation and Maintenance of Physical Plant

Total Entitlement Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Projected FTE Enrollment		Ohio	
Gross Area Footage		Michigan	
Rate per Unit		Ohio Michigan	
Fixed Entitlement		Michigan	

Line Item Approach

Unit/Component	Method of Calculation: Staffing Standard	Workload	Percentage Base
Building Maintenance			
Type of Construction			Texas Washington
Air Conditioning			Texas Washington
Building Replacement Value			Texas Washington
Custodial Services			
Total Square Footage	Washington	Texas	
Standard Salary	Washington		
Rate per Unit		Texas Washington	
Man Year Entitlement		Washington	
Grounds Maintenance			
Acres Maintained	Texas Washington	Washington	
Standard Salary	Texas Washington		
Base Headcount Enrollment	Texas		
Total Linear Feet of Buildings	Texas		
Rate per Unit		Washington	
Central Maintenance			
Total Gross Square Feet		Alabama Tennessee	
Rate per Unit		Alabama Tennessee	
Building Replacement Value			Texas
Base FTE Enrollment	Texas		
Base FTE Employees for Retirement	Texas		
Standard Salary Rate	Texas		
Utilities			
Building Maintenance Entitlement		Washington	
Total Gross Square Feet		Alabama Tennessee	
Rate per Unit		Alabama Tennessee Washington	

Several line items are considered as an alternative to the total entitlement approach. Building maintenance, in both the Texas and Washington formulas, derive a building factor, or maintenance cost factor, which is a percentage reflecting the type of building construction: wood, masonry-wood, and masonry, and whether or not the building is air-conditioned. The replacement value of the building is then multiplied by this percentage to generate the maintenance requirement for each building, and those amounts are summed to generate the maintenance entitlement for the entire institution.

Custodial, or janitorial, services are also included as a line item in the Texas and Washington formulas. In the Texas formula, the total square footage of the outside dimensions of educational and general buildings is multiplied by a standard rate per square foot ($0.5358). Washington's budget formula for custodial services reflects two distinct categories: salaries and operations. In determining the salary entitlement, the total square feet served is divided by a standard productivity rate per FTE staff (20,000 sq. ft.) to which is added any institutionally justified adjustments. The resulting number of non-year positions is then multiplied by a standard salary rate. The operations entitlement is determined on the basis of a standard rate per man-year.

Another line item considered in the Texas and Washington state budget formulas is grounds maintenance. The Texas formula uses a staffing standard method in estimating this entitlement, where the number of hours required to maintain the grounds is a function of the total linear perimeter of the buildings, the total number of acres of lawns and maintained areas, and a base term headcount enrollment. The number of hours is then multiplied by an average hourly rate. The staffing standard method is also used in the Washington formula for estimating the salary component of grounds maintenance. The number of required positions is determined as a function of the number of acres, where the acres are categorized into four types of acreage, such as lawns or paved areas. A standard number of acres per man-year by category is divided into the acres to determine the number of required positions, to which numbers of institutionally-justified positions are added. The total number of positions is then multiplied by a standard salary rate. The operations entitlement for grounds maintenance is estimated by multiplying the number of acres by category by a standard rate per category.

Both Alabama and Tennessee in their budget formulas for general maintenance consider the entitlement to be a function of the total gross square feet for educational and general space, which is multiplied by a specific rate per square foot. The approach taken by Texas for this category uses two methods. Part of the formula estimates the number of hours required on the basis of the base period FTE enrollment and the number of FTE employees eligible for retirement and then multiplies this by the average hourly rate. A second factor includes 2.8% of the replacement cost of the buildings as part of the general maintenance requirement. A minimum of $106,000 for this category is also stipulated in the Texas budget formula.

In budget formulas including utilities as a distinct line item, the factors used by Alabama and Tennessee are the total gross square feet multiplied by a specific rate per square foot. Washington's budget formula multiplies the amount derived as the building maintenance entitlement by a standard rate of 10 to estimate the utility maintenance entitlement.

3.9 Adjustments

Although the budget formula may project the resource requirements of an institution, the amount actually appropriated by the state does not necessarily equal that need. The amount to be appropriated is typically determined by negotiations between the institution and the various state agencies, including the legislature. Louisiana's formula specifies that the state should support 73% of the institutional needs and has built this factor directly into the budget formula. Michigan, while not specifying a particular method, suggests several alternatives.

1) The state will guarantee a percentage of the gross amount derived by the model for each sector, i.e. 80% for the state colleges, 75% for the universities, and so on.

2) The state will deduct a standard of 40% of the amount derived by the model for instruction from the gross amount derived by the model.

3) The state will guarantee a percentage of the amounts derived by the model for each of the various components, i.e. Instruction - 75%, Research - 50%, Public Service - 50%, Academic Support - 75%, Student Services - 50%, Institutional Support - 50%.

4) The state will deduct a standard amount per student to reflect tuition income.

The approach reflected in the fourth Michigan alternative has been adopted by four of the states included in this study: Alabama, New Mexico, Oklahoma, and Tennessee, and as indicated in Table 12, they have expanded the approach beyond the tuition adjustment. A deduction is also made for the recovery

of indirect costs (New Mexico - 20% and Tennessee - 80%). Revenues from governmental sources, other than the state, are included as deductions in the Oklahoma and Tennessee formulas, as well as income from the sales and services of educational departments. New Mexico's budget formula deducts 80% of the institution's earnings from investments. Another deduction, labeled a maintenance fee deduction, is included in the Tennessee and New Mexico formulas. In both, the deduction is based on the credit hours produced and a specified rate per credit hour; Tennessee's also includes a standard deduction based on headcount enrollment. Revenues from intercollegiate athletics is another deduction in the Tennessee formula. Both Tennessee and Oklahoma deduct income from miscellaneous sources. Only New Mexico's budget formula provides credit to the institution for student scholarships and the amount expended for NDSL matching funds.

Table 12

Adjustments

Debit Component	State
Tuition and Related Fees	Alabama New Mexico Oklahoma Tennessee
Recovery of Indirect Costs	New Mexico Tennessee
Governmental Services	Oklahoma Tennessee
Sales and Services of Educational Department	Oklahoma Tennessee
Investment Earnings	New Mexico
Maintenance Fee Deduction	New Mexico Tennessee
Intercollegiate Athletics	Tennessee
Miscellaneous Sources	Oklahoma Tennessee
Credit Component	
Student Scholarships	New Mexico
NDSL Matching Funds	New Mexico

3.10 Health Areas

Three states--Alabama, Ohio, and Oklahoma--consider the education of health specialists as separate entities on a formula basis. For the most part, the remaining selected states also consider the health areas individually but base the appropriation on specific institutional justification. Michigan's incremental funding approach is the most explicit in respect to institutional justification; entitlement for the health professions is equivalent to the current amount plus an amount for inflation (6.5% of the current amount) plus any program changes.

The Alabama budget formulas for health instructional areas distinguish between medical school funding and dental and optometry school funding. Both are based on projected enrollment. The medical school funding formula, however, is based on a staffing standard method where the number of positions is derived from the enrollment and specified student-faculty ratios. The number of positions is then multiplied by a salary rate per position. The entitlement for the dental and optometry schools, on the other hand, reflects a workload method where the enrollment is multiplied by specific rates per student. For both formulas, the entitlements are adjusted for tuition revenue.

In the Ohio budget formula, like the Alabama formula, two models are specified, one for medicine and one for dentistry, optometry, and veterinary medicine. Both models reflect identical procedures and differ only with regard to the specific rates. The models specify rates per FTE student for the areas of instruction and departmental research, academic support, student services, institutional support, and plant operation. The rates for all areas, except the instruction area, are based on historical costs which exclude funds from federal government capitation grants. The rate per FTE student in the instruction category is comprised of three factors: faculty compensation, other departmental compensation, and other departmental expenses. Faculty compensation per student is based on the student-faculty ratio (4.5 to 1 in medicine, 6.5 to 1 in the other health professions) and the average annual salary per faculty member, which is also differentiated in the two models. The remaining departmental expenses are based on historical cost studies which derive the average cost per student. By multiplying the derived costs per student by the projected FTE enrollment, the entitlements for each model are obtained.

Oklahoma's budget formula considers health-related instructional programs and libraries on the basis of formulas; the other areas--general administration and expense, continuing education, organized research, and plant maintenance

and operation--are handled as incremental budget items. The instructional areas reflect the staffing standard method taken in conjunction with a line item approach differentiated for each of the programs: medicine, dentistry, nursing, health, graduate college, and pharmacy. Faculty salaries, as a line item, are determined on the basis of projected FTE students, specified student-faculty ratios, and salary rates per position. Other professional salaries are based on a fixed number of positions, dependent on the particular program, and a fixed salary rate, while support staff salaries are based on the number of FTE faculty positions, specified staff-faculty ratios, and standard salary rates. Benefits are derived as a percentage (7%) of the salaries, and other instructional expenses as a percentage (12%) of all salaries and benefits. Library entitlements also reflect, for the most part, the staffing standard method and line item approach. Fixed numbers of professional and support staff and standard salary rates are specified. Other library expenses are a percentage (12%) of the salaries and benefits, and the entitlement for books, binding, and printing is 69% of the total for salaries, benefits, and other library expenses.

4.0 Development and Maintenance of a Formula Budgeting Process

In a study recently published by the Center for Research and Development in Higher Education at the University of California at Berkeley, Meisinger (1976) addressed the processes involved in the evolution of a formula in the state budgeting process. His concern was not for the specific components, methods, or approaches reflected in the developed formulas, but rather on the questions of how a formula is introduced to the budget process, why and how a formula is modified, and what factors are involved with the dissolution of a budget formula. In addition, Meisinger discusses the strategies and counterstrategies used by the agencies and institutions involved in the state budgeting process. Three case histories: California, Illinois, and Texas, (two of which, California and Illinois, have abandoned formula budgeting), serve as the foundation for his comments and observations. The following brief review of this work provides insight into the problems confronting the relationship of public institutions and state government. The implementation and use of a budget formula requires not only the development of the specific component relationships but also the recognition and development of the organizational structure and technological bases required to support it.

4.1 Introduction of a Budget Formula

Central to the introduction of a budget formula to the state budget process is the delineation of the sources of initial support for the concept. In the early 1950's, state support for the development of a statewide California budget formula was derived primarily from the executive budget office. It was the Department of Finance, with the backing of state colleges, which argued for a formula based on statewide staffing standards. In Illinois, the impetus for the development of a budget formula was derived from the

emergence of a state college system during the 1960's and from a rivalry between two state universities. Among the public institutions in Illinois, the budget formula approach was seen as the mechanism which would provide an equitable distribution of state funds and reduce the political uncertainties that existed. In Texas, the legislature was the predominant force in the introduction of a budget formula, with strong support from the larger institutions. Regardless of the source of support for the introduction of a budget formula, the budget process requires that the concept receive the support of the constituencies that will be directly affected by the formula: the executive budget office, the legislature, the state agency for higher education, and the individual institutions. Without the final support of these groups, the legitimacy of the formula concept for resource allocations is brought into question and adoption of effective implementing procedure is made more difficult.

To facilitate the development of support for the concept, an organizational framework for the design and implementation of the budget formula must be well-planned. As a partial solution to this situation, California, Illinois, and Texas each used task forces or committees, composed of representatives from the various concerned constituencies, to develop the formulas. These task forces encouraged participation and communication among the various groups which assisted in making legitimate the use of formulas. Furthermore, having developed a specific formula, an organizational structure that will provide for the implementation of the process must exist. If the formula is to achieve the objectives for which it was developed, the roles of each constituency must be clearly delineated.

Finally, the development of a formula budget requires that an adequate information base be available, and the mechanisms for collecting and updating this data base must also be defined. The development of a formula necessitated that definitions be developed and applied uniformly and that historical as well as current information be obtained and analyzed. In the three cases studied by Meisinger (1976), the specific parameters and components to be included in the formula evolved from data elements already a part of the decision-making process. While the data structure and particular definitions became more unified across the institutions, the basis was already firmly rooted within the existing framework. The problem is more difficult when existing data bases and agreed definitions do not exist or are inconsistent across the system.

4.2 Modification of a Budget Formula

Once having introduced a budget formula into the budgeting process, it is necessary to insure that the formula can be updated and modified to respond to changing conditions. While this may be limited to only the updating of the data base, it typically requires more extensive revision resulting from changes in definitions, the addition or deletion of specific components, or a change in the basic philosophical premises underlying the formula. As shown by the experiences of California, Illinois, and Texas, disenchantment with the initial and subsequent formulas by any one of the constituencies involved and pressure from external forces are two primary factors. New definitions of an FTE student and new formulas to cover additional aspects of the institutional budget were some of the things to be altered in the Texas formula. The completion of accurate cost studies and a change in the legislature's philosophy from an incremental to comprehensive budgeting concept were two concerns in Illinois. In California, efforts focused on the adjustment of a factor to give more faculty workload credit for laboratory instruction, the provision of a differential for graduate study, and the inclusion of state support for faculty research.

Again critical to the modification of a budget formula is the provision for an organizational structure. This was one of the major weaknesses in the California formula budgeting process, while the continued success of both the Illinois and Texas systems could be attributed in part to the provision of a mechanism for formula modification organized around a committee structure. The importance of this structure, representing all relevant constituencies, is that it provides for continuity and an on-going mechanism for the systematic review of the formula budgeting process. In addition, such participation facilitates interinstitutional exchange of ideas, better communication, and more ready acceptance of any modification in the budget formula. Given the long success of the Texas formula budgeting process, its organization is particularly noteworthy. Central to the process is the Advisory Committee and the Coordinating Board. The Advisory Committee, composed of representatives from the institutions, makes recommendations to the Texas Coordinating Board regarding formula modifications each biennium. These recommendations, which may or may not be accepted, are considered in developing the final budget recommendations sent by the Coordinating Board to the Legislative Budget Board and the Executive Budget Office. Recommendations by the Coordinating Board are typically incorporated into the state budget instructions without modification.

The success of this approach is attributable in part to the informal participation of representatives from both the legislature and executive budget offices. On some occasions, the Coordinating Board appointed special Formula Study Committees for each of the existing and proposed formula areas. These Committees were charged to review, evaluate, and recommend changes in the formulas to the Advisory Committee.

A third important consideration in the modification of a budget formula is the provision of the technological data base required to support the modification. This may require the development of new survey instruments, the revision of existing data retrieval systems to support both analytical studies as well as for actual changes in the formula. To some extent, changes in a particular budget formula may be limited because of the costs associated with the collection and analysis of new data.

4.3 Dissolution of a Budget Formula

As indicated in Meisinger's study (1976), California and Illinois abandoned their state budget formulas early in the 1970's, while that in Texas remains in effect. One essential component leading to the Texas success in retaining the budget formula process is that the state has never been confronted with serious economic situations, as were California and Illinois. The demise of the California budget formula occurred during the 1970-71 fiscal year when the state revenue base was not expected to increase and the legislature was unwilling to increase taxes. Higher education was one area where budget cuts could be applied. In the last phase of the California financial crisis, higher education budgets were reduced and the use of the formula was dissolved. In a similar situation, higher education in Illinois became a lower priority item in the state executive offices. In addition, this sector was charged with waste, inefficiency, mismanagement, and poor administration. These charges, concomitant with the financial condition of the state in the late 1960s and the imposition of a state income tax, reduced public and legislative support for higher education. The end result, as in California, was the reduction of the higher education budget and the abandonment of the budget formula.

As these case studies illustrate, crucial to the implementation of a formula in the state budgeting process is maintenance of a level of trust and confidence among the state agencies and institutions involved. The erosion of this trust and confidence in California and Illinois was, in part, attributable

to the manipulation of the formulas by the institutions to maximize their budget appropriation. Manipulation can occur either through the legal processes of formula change or through the misrepresentation of the historical or projected institutional data. California's budget formula, which was based on enrollment and staffing standards, was abused by several institutions by enriching the curricula with courses with more advantageous staffing weights. Extensive auditing of institutional records undertaken by the executive offices of the state revealed critical infractions. These "paper" audits were then extended to on-the-spot audits where auditors would actually be disguised as students and attend classes to note enrollments and modes of instruction. The formula was then used not as a resource acquisition tool, but as an audit track; the institutions were required to spend the funds as allocated, line item for line item. This situation of formula manipulation on the part of the institutions and controlled audits on the part of the executive offices, eroded the trust and confidence of the parties involved in the budget process.

In contrast, in Texas little formula manipulation has been evidenced, attributable partially to the structural design of the formula as well as the roles and functions played by the state agencies. Based on actual credit hours produced, the formula does not explicitly define the number of instructional positions required, but rather allows the institution to employ any number of faculty within the constraints of their resources. This is in contrast to the California formula where the budget formula derived the number of required faculty and the institutions were held accountable for the derived number. In addition, administrative positions are not funded as a result of credit hour production, and the incentive to include faculty in administrative positions to enlarge the appropriations present in the California formula is nonexistant in the Texas approach. The penalty for misrepresentation of institutional data is a reduced appropriation for the next fiscal period. Another factor in the formula manipulation problem is the latitude provided for additional funding. In Texas, institutions may request and, upon justification, be allocated funds beyond that resulting from the formula. Finally, contingency funds are available if institutions have legitimate additional fiscal requirements, particularly for periods of unexpected growth.

A third characteristic of the dissolution of the budget formula in both California and Illinois was the breakdown in the interorganizational lines of communication. The communication system either closed down completely

or the flow of communication was uni-directional. Although the budget formula was to have functioned so as to reduce the political uncertainties, with the breakdown in communication the formula became the vehicle for the return of highly political budget negotiations.

4.4 Strategies and Counterstrategies in the Budget Formula Process

The budget process revolves around the submission of institutional requests for funding, the review of those requests by state agencies and the legislative committees, and the appropriation of funds by the legislature. The role of the institution in this process is typically focused on the maximization of its funding level, and that of the state agencies, and the legislature on its reduction. As a result, the institutions attempt to develop strategies to ensure maximal funding. As Meisinger (1976, p. 124) describes these strategies relative to the formula budgeting process, they include: 1) the expansion of course offerings and new programs, 2) padding, 3) formula manipulation, 4) formula enrichment, or 5) acquisition of external funds. At the state level, state agencies and the legislature also develop strategies and counterstrategies to restrict budget growth. These activities include: 1) funding delay, 2) new program control, 3) reallocation targets, 4) base-reduction targets, 5) budget ceilings, 6) productivity reductions, 7) management audits, 8) reduced tolerances on enrollment projections, or 9) introduction of a new formula.

To a significant degree, the use of such strategies on both sides effects and determines the degree of mutual trust and confidence that the major participants have in the budgeting system. The cooperative design of the formula is critical in ensuring that shared trust and confidence, rather than mistrust and disillusionment, mark the implementation of a formula budget system.

5.0 RECOMMENDATIONS FOR A COMMONWEALTH OF PENNSYLVANIA BUDGET FORMULA

If the Commonwealth of Pennsylvania and the public institutions of post-secondary education, including the state-owned, state-related, and community college sectors, are to pursue the development and implementation of a state budget formula, several factors must be addressed. The establishment of a budget formula requires an organizational structure which identifies the roles and responsibilities of individuals, institutions, and agencies who will participate in the development of the formula. Responsibility for the specification of the design of the budget formula should be assigned to this organizational structure. Implementation of a budget formula once developed also requires the development of a systematic process that carefully addresses the role and responsibility of all participating agencies and provides for the interface of the budget formula and the budget process. The purpose of this section is to present discussions and recommendations relative to these concerns.

5.1 Organization for Developing a Commonwealth Budget Formula

Overall the integration of a state budget formula into the ongoing budget process is a difficult problem. As shown by the three case studies discussed in Section 4, the utilization of a task force or committee organizational structure as the medium for the development phase appears to be the most successful. By including representatives from the institutions, the state coordinating board for higher education, and the executive and legislative branches of the state government, the task force imparts to the budget formula development process a degree of legitimacy. Representation by these critical constituencies will maximize the potential for uncovering inadequacies at this phase rather than at the time of implementation. In addition to a working task force, it is imperative that professional staff support personnel be

provided to conduct the necessary work of collecting the required data, conducting the relevant cost studies, deriving the formula weights, and testing the various formulas for adequacy and equity.

5.2 Recommendations for the Design of a Commonwealth Budget Formula

The design and structure of a budget formula is critical to its viability as part of the budget process. The formula must be both equitable and adequate; otherwise, its legitimacy will be brought into question by institutions themselves. In addition, the formula must reflect the political milieu in which it will function in order to reduce political uncertainties and ensure accountability. The builders of the formula must recognize that the manner in which specific functional categories are addressed may increase the political uncertainties rather than reduce them. For example, the incorporation of faculty salaries as a separate line item opens the salary rate per faculty member as a potentially negotiable item. In the design of a budget formula, those areas subject to negotiation and the political process must be carefully recorded. Another consideration is the availability of the data required to support the formula. Unless a statewide data base exists which has the data elements required or the procedures designed to collect the information, the budget formula will not function regardless how well designed and sensitive to change it is. Accountability will also be jeopardized by an inadequate state-wide data base.

Halstead (1974, pp. 663-4) suggests several criteria for judging the quality and effectiveness of state budget formulas. The developed budget formula must exhibit validity. It must accurately estimate the budget requirements of the institutions. Otherwise, gross deficiencies, surpluses, and inequities may be perpetuated. Comparisons of actual budget patterns with formula estimates must be continually made to insure the legitimacy of the formula. Quantitative definitions of the factors included in the formula must be developed. These factors should be expressed, to the extent possible, in measurable, potentially countable terms. Where judgment is required, such as the development of weights, decisions should be based on empirical evidence. Formulas to be effective also must be sensitive to change in the demand for services and areas of growth. This criterion often requires that the formulas be rather complex, which may reduce their understandability. Closely related to the criterion of sensitivity, adaptability of the formula to the unique missions and goals of the institutions must be considered, but not to the

extent that the communalities of the institutions are obscured. Standardization of the definitions and formula factors will facilitate the process of comparison of programs and institutions, both within the state and with other states. Finally, the budget formulas must be understandable to the users. Simplicity is the key, but not to the exclusion of the formula's sensitivity to change, adaptability, and validity.

The recommendations for the design of a budget formula for the Commonwealth will attempt to address these concerns. For the most part, the recommendations reflect a total entitlement approach. This approach, while somewhat limiting the formula's sensitivity to change, provides understandable and valid presentation of the factors involved in the estimation of an institution's financial requirements. In addition, the recommendations emphasize the workload method, which has a realistic potential for reducing the political negotiations arising from the use of a budget formula. Rather than explicitly delineating the required number of positions and salary rates, such factors as salaries and operating expenses are implicit within a determined rate. The workload method is also more sensitive to change and adaptive to new conditions than is the percentage base method. The recommendations which follow are intended to serve as a basis for discussions and do not represent a comprehensive or detailed analysis of the problems associated with the development of a budget formula.

Recommendation 1.

Separate budget formulas should be developed for the state-owned, state-related, and community college sectors. Given the distinctive missions of these three sectors, as reiterated in the 1971 Master Plan, no single formula could accurately and equitably address their respective resource requirements. The Commonwealth, unlike other states, has developed for certain major components of the system the concept of "state-relatedness" which differs from the usual status of major universities in the public sector. Therefore, the development of three parallel, but differing, formulas for three sectors is required, given this unique structure.

Recommendation 2.

Separate formulas should be developed for the health related, professional areas of medicine, dentistry, and veterinary medicine. These professional areas, because of the unique nature of instruction involved, represent a

specialized set of conditions that require the development of formulas representing their specific needs. The nature of the costs associated with such areas differ significantly from the other institutional areas and, therefore, require a different formula.

Recommendation 3.

Standard definitions for the major functional categories should be established, and the formula methodology should be consistent across the three sectors. While having three separate budget formulas permits a great deal of flexibility and addresses to some extent the concern for validity, the comparability of definitions and general methodology of the formulas must be insured to ensure equity and accountability.

Recommendation 4.

The budget formulas for each sector should address the functional categories of instruction, research, public service, academic support, libraries, student services, institutional support, and operation and maintenance of the physical plant. Underlying this recommendation is the assumption that the state recognizes instruction, research, and public service as important activities for the benefit of the Commonwealth and that specific support activities are a natural result of engaging in these major missions. Also, it is assumed that the state desires to support such activities. Because of the differing missions of the three sectors, however, not all of these categories will necessarily be of the same importance nor included in each formula (e.g. community colleges would normally not receive funds for research).

(a) The budget formula for instruction should be based on the total entitlement approach and a workload method based on projected student credit hour production and specific rates per credit hour. To increase the sensitivity of the budget formulas, standard instructional program areas (e.g. education, engineering, humanities, etc.) and program levels (e.g. lower-level undergraduate, upper-level undergraduate, graduate I, graduate II, etc.) should be differentiated, and specific rates for each program area and level should be determined. The rates per student credit hour should be developed from historic cost studies by sector and should incorporate the direct costs of instruction: faculty and staff salaries, fringe benefits, and other departmental operating expenses. These rates should be adjusted annually to incorporate inflation increases in these costs.

(b) Funds for the support of research activities should be allocated as on a percentage of each institution's external sponsored funding relative to the statewide total. This proposal is similar to that used in Tennessee where general research funds, other than for specific project grants and contracts, are set aside and distributed on the basis of each institution's ability to generate external funding. Research conducted at the Commonwealth's postsecondary educational institutions provides benefits, to the state and society and the institutions should be given incentives to increase their efforts to obtain external funding for research. Excluded would be funds provided by the federal government through the state under land-grant legislation to the Pennsylvania State University. In addition, the state should channel funds to support specific research projects of high value to the state to the appropriate agencies of state government for allocation to both public and private universities on the basis of competitive proposals.

(c) Public service activities should be supported as a percentage of the instruction entitlement, where that percentage is derived from historic studies by sector. While the percentage method is generally not preferred because of the assumptions underlying its use, the difficulty in developing a reliable and valid measure of public service, such as the continuing education unit, headcount enrollment, or the contact hour, precludes alternative methods at this time. Until such an indicator is developed, however, the percentage method appears to be the most feasible alternative.

(d) Academic support should be based on a workload method, where projected student credit hour production is differentiated by level and multiplied by historic rates per credit hour, adjusted for inflation. The underlying assumption is that academic support activities (e.g. academic administration, museums and galleries, media and technology, and separately budgeted course and curriculum development) are related to student credit hour production and that the costs differ by instructional level. Headcount enrollment may be another factor associated with this functional category, and its use in the formula also should be investigated.

(e) Support for libraries should reflect two line items: general library support and library maintenance. General support for library expenses should be calculated on the basis of projected headcount enrollment, by level, multiplied by an historically-defined rate per student, adjusted for inflation. Enrollment should be weighted by student level to reflect the differential effects

on general library expenses. The maintenance component of the library formula should take into account the number of volumes and an historic rate per volume, adjusted for inflation.

(f) Support for student services should be calculated as a mixed cost component using a workload method based on projected headcount enrollment, differentiated by level, multiplied by standard historic rates per student, adjusted for inflation. Since student service activities include the admissions and registrar offices, a fixed amount should be provided for those components and a variable amount should be included contingent on the headcount enrollment. Student services are provided regardless of whether the student is full-time or part-time; and, therefore, headcount enrollment is the most reasonable index of costs.

(g) The entitlement for institutional support should incorporate a fixed level of support, plus a variable component calculated by a workload method sensitized for each subordinate activity on the projected FTE faculty, FTE staff, or student credit hour production, multiplied by specific rates per unit derived from historic cost studies, adjusted for inflation. Many of the costs associated with the central management, planning, fiscal operations, employee and personnel records, and so on are fixed regardless of changes in other variables. The variable factors of FTE faculty, FTE staff and credit hour production, however, provide indices of institutional complexity, an important factor in institutional support expenses.

(h) The formula for the operation and maintenance of the physical plant should reflect the line items of custodial services, grounds maintenance, building repair and maintenance, and utilities. Each line item, with the exception of building repair and maintenance, should be calculated by the workload method, on the basis of gross square footage, acreage, or cubic feet of space, where the rates per unit are historically derived and adjusted for inflation. Most institutions in recent years have deferred substantial repair and maintenance of buildings, developing thereby a significant backlog of maintenance projects. Historic cost studies, therefore, are likely to undervalue this component. To ensure a reasonable level of funding for building repair and maintenance, support for this element should be calculated by the workload method on the basis of gross square footage of each building, sensitized as to the age, condition, type, and structure of each building. Rates should

be derived on the basis of sound judgement by professionally qualified persons or historic cost data drawn from industry. By distinguishing among these line items, the differential influence of inflation on each can be more readily incorporated.

(i) Where the particular formula derived entitlements are based on projected units (credit hours, headcount enrollment, FTE enrollment), a correction factor should be applied to adjust for over- or under-estimates of volume which exceed 5%.

Recommendation 5.

An adjustment to the total formula-derived entitlement should be made for the projected tuition income of each institution. Tuition income, which is a function of enrollment, is the other major source of revenue for institutional support and legitimately should be used to adjust state funding to meet the institutional resource requirements derived from the formula. Other sources of income, however, such as endowment income, gifts, and governmental grants and contracts should not be debited against the projected resource requirements. State policy should encourage efforts by institutions to generate such outside support to improve quality and to fund programs that the state should not be expected to fund. Income from such sources, therefor, should be allowed as credits and reinforcement to the institution. Any effort by the state to deduct such funds from state support will result in the drying up of such sources of support.

5.3 Implementation of the Budget Formula

Once a budget formula has been designed and developed, procedures must be developed to implement and maintain this budget mechanism. The relationships among the various state agencies and institutions and the responsibilities of each must be formally defined. In addition, the interface of the current budget process with that required by the new formula must be carefully assessed, and procedures formulated to manage the transition to the new system. These are often the most difficult aspects of formula budgeting, since decisions in these areas impact directly on power relationships and may require sharp changes in attitudes, philosophies, and personnel. Because of these complexities, the purpose here is not to present recommendations for these aspects of the budget formula but rather to raise questions which must be addressed in arriving at acceptable policies and procedures.

The implementation of a budget formula, since it is based on quantitative information, requires that an agency be identified which will be responsible for collecting, editing, verifying, and analyzing the data required as input to the formula. Differences in interpretation of the rules and definitions must be authoritatively resolved. In addition, the assumptions underlying the formulas must be tested and verified regularly. When necessary, formula revisions and modifications to definitions, rates, weightings, and so on must be tested and implemented. Who should be responsible for these aspects of the budget process? What should be its structure and authority? How should this agency or agencies interface with the institutions and with the other state agencies? How should the roles of the existing constituencies be incorporated into the budget process? All these questions must be explicitly answered if the formula is to be successful beyond the development phase.

Regardless of the specific design and structure of the budget formula and of the organizational and policy framework for implementing the budget formula process, all concerned must recognize that the formula represents an estimate--an approximation--of the institutional financial needs. When these recommendations are presented to the legislature, actual appropriations may not result in full formula funding due to constraints on total resources available to the state or the priorities established by the legislature among state programs. Thus, the estimates provided by a budget formula will not necessarily guarantee a level of funding adequate to meet all realistic institutional needs. A budget formula it is by no means a panacea for the financial problems faced by public institutions in Pennsylvania. And, if experience in other states is instructive, the possibility always exists that the formula approach may be abused and used as a means to punish educational institutions for real or imagined deficiencies in performance. Despite these limitations, however, a properly developed and maintained budget formula can help state agencies and institutions define their basic resource requirements, facilitate rational decision-making, and help insure that institutions will be treated equitably in the allocation of public funds.

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APPENDIX

Alabama

Summary of State Budget Formula (FY 1977-78)

Description

Central to the Alabama budget formula is the development of the instructional and departmental research entitlement which, in the formula for four-year colleges and universities, is reflected in a rate per credit hour. This rate, the instructional complexity factor, is derived by taking the actual average faculty salary across Alabamian institutions for a given year and projecting its rate for the desired budget period with a projected inflationary factor. The projected salary rate is then divided by a stipulated faculty credit hour workload, such as 570 credit hours per faculty member. This value then represents the average projected rate per credit hour required to support faculty salaries. To this rate is added a rate per credit hour for departmental operating expenses, presumably based on historical data. To the sum of these two rates is added a percentage factor for merit and promotion increases, such as 3%, and this final result is the instructional complexity factor, a projected rate per credit hour which should fund instructional and departmental research activities. Credit hours, delineated by various discipline areas for three levels of instruction, are then weighted to incorporate the differential costs of disciplines and instructional levels. The instructional complexity factor is then multiplied by projected weighted credit hours to derive the instructional and departmental research entitlement.

Specified as percentages of the instructional and departmental research entitlement, the Alabama budget formula also addresses the categories of research (2%), public service (2%), and academic support, exclusive of libraries (5%). Support for libraries is estimated on the basis of projected credit hours differentiated by level and multiplied by specific rates for each level. The entitlement for general administration and student services is based on headcount enrollment, but it is determined by rates which are differentiated by capacity levels. The rate per student, for example, for the first 1,000 students is $160.00, while that for each student above 8,000 is $91.43. To estimate the entitlement for the operation and maintenance of the physical plant, the gross square footage for educational and general space is multiplied by a standard

rate per square foot, $1.58. Amount for utilities is also based on the gross square footage, but the rate is historically derived and adjusted for inflation. Institutional support is derived as 2% of sum of preceding items except for the utilities category. The budget formula also provides for a tuition multiplied by the projected credit hour production. The Alabama Commission on Higher Education's budget recommendations for 4-year colleges and universities are derived by summing the entitlements for the categories of instruction through institutional support and subtracting the tuition adjustment.

Funding for the schools of medicine, dentistry, and optometry are addressed separately on the basis of formulas. For the medical schools, projected enrollments for each school are divided by specified student-faculty ratios, such as 3:1, to determine the number of required positions. The number of positions is then multiplied by a statewide salary rate per position. Funding for the dental and optometry schools is based on projected enrollments and on historically derived rate of total support per student. The final funding recommendations for these health professional schools are developed from these factors with adjustments being made for revenues.

Mathematical Representation (for 4-year Colleges and Universities)

1. Instruction and Departmental Research

   a. Derive the Instructional Component Multiplier.

$$\left\{\left[\begin{array}{c}\text{Actual average}\\ \text{statewide}\\ \text{faculty salary}\end{array}\right] \times \left[\begin{array}{c}\text{Projected}\\ \text{Inflationary}\\ \text{Factor}\end{array}\right] \div \left[\begin{array}{c}\text{Stipulated}\\ \text{Credit Hour}\\ \text{Production}\\ \text{per Faculty}\end{array}\right] + \left[\begin{array}{c}\text{Stipulated rate}\\ \text{per credit hour}\\ \text{for departmental}\\ \text{operating expenses}\end{array}\right]\right\} \times \left[\begin{array}{c}\text{Stipulated}\\ \text{percentage}\\ \text{for merit and}\\ \text{promotion}\end{array}\right] = \left[\begin{array}{c}\text{Instructional}\\ \text{Component}\\ \text{Multiplier}\end{array}\right]$$

   b. Weighs the projected credit hours by discipline and level.

$$\left[\begin{array}{c}\text{Complexity}\\ \text{Indices}\end{array}\right] \times \left[\begin{array}{c}\text{Projected}\\ \text{Credit Hours}\end{array}\right] = \begin{array}{c}\text{Projected}\\ \text{Weighted}\\ \text{Credit Hours}\end{array}$$

WEIGHTING FACTORS			
Academic Subdivision Groupings	Complexity Indices		
	Under-graduate	Graduate Level 1	Graduate Level 2
1. Business	1.12	3.27	1.
2. General	1.00	2.73	10.33
3. Education	1.04	2.90	8.79
4. Nursing, Health	2.74	4.94	17.60
5. Engineering	2.07	5.46	17.60
6. Fine Arts	2.09	4.95	17.71
7. Home Economics	1.39	3.34	9.31
8. Science	1.29	5.36	17.60
9. Military Science	0.12	-	-
10. Law	-	1.75	-
11. Architecture	1.67	4.79	16.52
12. Agriculture	1.51	4.57	16.03
13. Veterinary Medicine	-	5.77	20.53
14. Pharmacy	2.07	5.06	14.09
15. Interdisciplinary	1.26	3.23	10.33

$$\begin{array}{c}\text{Amount for}\\ \text{Instruction}\\ \text{and Departmental}\\ \text{Research}\end{array} = \left[\begin{array}{c}\text{Instructional}\\ \text{Component}\\ \text{Multiplier}\end{array}\right] \times \left[\begin{array}{c}\text{Projected}\\ \text{Weighted}\\ \text{Credit Hours}\\ \text{Produced}\end{array}\right]$$

2. Academic Support
   5% of amount for instruction and departmental research

3. Research
   2% of amount for instruction and departmental research

4. **Public Service**

2% of amount for instruction and departmental research

5. **Libraries**

$$\text{Library Support} = \begin{bmatrix}\text{Projected Unweighted Credit Hours by Student Level}\end{bmatrix} \times \begin{bmatrix}\text{Rate per Unweighted Credit Hour by Student Level}\end{bmatrix}$$

where rates are:

Undergraduate	$ 2.66
Graduate I	5.34
Graduate II	22.84
Law	14.10

6. **General Administration and Student Services**

$$\text{Entitlement} = \begin{bmatrix}\text{Fall Term Headcount Enrollment}\end{bmatrix} \times \begin{bmatrix}\text{Specified Rate by Capacity}\end{bmatrix}$$

where rate by capacity is:

Enrollment	Rate
First 1,000	$160.00
Second 1,000	136.00
Next 2,000	124.05
Next 4,000	101.49
Above 8,000	91.43

7. Operation and Maintenance of Physical Plant

$$\text{Maintenance} = \begin{bmatrix}\text{Gross Footage for Educational and General Space}^1\end{bmatrix} \times [\$1.58]$$

[1] Excludes all space associated with auxiliary enterprises.

8. Institutional Support

2% of the sum of items 1 through 7

9. Utilities

$$\text{Utilities} = \left[\begin{array}{l}\text{Gross Square Footage}\\ \text{for Educational and}\\ \text{General Space}^1\end{array}\right] \times \left[\begin{array}{l}\text{Rate per}\\ \text{Square Foot}\end{array}\right] \times \left[\begin{array}{l}\text{Projected}\\ \text{Inflation}\\ \text{Factor}\end{array}\right]$$

[1]Excludes all space associated with auxiliary enterprises.

10. Adjustments

$$\text{Adjustment} = \left[\begin{array}{l}\text{Average Rate per}\\ \text{Credit Collected}\\ \text{from Tuition}\end{array}\right] \times \left[\begin{array}{l}\text{Projected Un-}\\ \text{weighted Credit}\\ \text{Hour Production}\end{array}\right]$$

The Alabama Commission on Higher Education recommendations for 4-year colleges and universities are then derived by summing formula items 1 through 9 and subtracting the tuition adjustment.

Mathematical Representation (Health Instructional Programs)

1. Medical Schools

$$\text{Medical School Funding} = \left\{\left[\begin{matrix}\text{Projected} \\ \text{Enrollment}\end{matrix} \div \begin{matrix}\text{Specified} \\ \text{Student} \\ \text{Faculty} \\ \text{Ratio}\end{matrix}\right] \times \left[\begin{matrix}\text{Specified} \\ \text{Salary} \\ \text{Rate per} \\ \text{Position}\end{matrix}\right]\right\} - \left[\begin{matrix}\text{Tuition} \\ \text{Revenue} \\ \text{Adjustment}\end{matrix}\right]$$

Separate student-faculty ratios are specified by institution, while the salary rate is constant for all institutions.

2. Dental and Optometry Schools

$$\text{Dental and Optometry School Funding} = \left[\begin{matrix}\text{Projected} \\ \text{Enrollment}\end{matrix} \times \begin{matrix}\text{Specified Rate} \\ \text{Support per} \\ \text{Type of Student}\end{matrix}\right] - \left[\begin{matrix}\text{Revenue} \\ \text{Adjustments}\end{matrix}\right]$$

The specified rate of support per dental student and per optometric student reflects faculty salaries, support salaries, and all other operating expenses. In addition, a pro rata adjustment for additional clinic and support costs was included for specific dental schools.

Louisiana

Summary of State Budget Formula (FY 1977-78)

Description

The Louisiana budget formula, based on credit hour production, presents a base factor chart which specifies the rates per credit hour. These rates are developed from historical data on faculty salaries, full time equivalent students, and student-faculty ratios and are delineated by major program areas and five levels. The entitlement recommendation for the forthcoming fiscal year is derived by multiplying the actual number of credit hours by program area and level for the base year period with the appropriate value from the base factor chart. The result is the salary base for instruction and related activities. To incorporate additional aspects of fiscal support, two guidelines are presented. The first factor specifies that the state should support 73% of the total educational and general financial needs of higher education institutions, and second, faculty salaries should reflect 66% of the expenditures for instruction and related activities. Following the algebraic manipulation of these factors, the state appropriation is determined by multiplying the salary base by 62.65% and adding the result to the salary base. If the institution is a small (fall FTE enrollment of 1,500 or less), 2-year institution, additional support is provided so that the percentage rate becomes 78.92%.

Broad guidelines for the allocation of the state appropriation across functional categories are also provided. Expenditures related to instruction, research, public service, and academic support (excluding library expenditures) should reflect 68% of the budget; libraries, 5%; student services, institutional support, and scholarships and fellowships, 15%; and operation and maintenance of plant, 12%.

Mathematical Representation

1. Determine the salary base.

$$\text{Salary Base} = \begin{bmatrix}\text{Base Period Credit} \\ \text{Hours by Program \& Level}\end{bmatrix} \times \begin{bmatrix}\text{Base Factor Chart} \\ \text{Rate by Program \& Level}\end{bmatrix}$$

SECTION III - BASIC FACTOR CHART

BASIC FACTOR CHART

(DOLLARS PER STUDENT CREDIT HOUR)

EFFECTIVE FOR 1976-77 FISCAL YEAR

PROGRAM AREA	HEGIS TAXONOMY CODES	LEVEL OF OFFERING				
		LOWER LEVEL UNDERGRADUATE	UPPER LEVEL UNDERGRADUATE	MASTER'S	SPECIALIST/ PROFESSIONAL	DOCTORATE
Agriculture	0101-0199	$ 26.00	$ 38.84	$104.62		$216.26
Engineering	0901-0999	26.67	44.84	110.78		228.52
Fine Arts & Architecture	0201-0299 1001-1099	31.65	44.81	104.62		228.52
Law	1401-1499				$ 61.54	
Nursing	1203	122.06	122.08	176.36		
Allied Health & Pharmacy	1208,1211-1215 1220,1223-1225	26.67	44.84	110.78		228.52
Sciences	0401-0499 and 0700-0799 and 1901-1999	22.84	36.93	110.78		228.52
Technology	5300-5399	26.67				
All Other: 1st 20,000 SCH's		28.84	26.18	104.62	138.47	210.26
All in Excess of 20,000 SCH's		19.24				

2. State Recommendation = Salary Base + 0.6265 (Salary Base)

For small (fall FTE enrollment 1,500 or less), 2-year institutions:

State Recommendation = Salary Base + 0.7892 (Salary Base)

Michigan

Summary of State Budget Formula (Proposed)

Description

Although the Michigan formula has not yet been implemented, it provides a somewhat unique approach to the development of a budget formula. The essential philosophy is one where the total resource requirements of the institution are estimated for each of the areas of instruction, research, public service, academic support, student services, and institutional support. The total estimate includes not only formula derived estimates but also non-formula estimates for grants and program changes. From the total budget estimate, certain amounts are to be deducted, although the specific methodology is not stipulated. Instead four alternatives for determining the state's share of the total institutional need are presented:

1) provide a percentage of total derived estimate for each sector, i.e. 80% for the state colleges, 75% for the state universities;
2) deduct a standard 40% of the estimate for instruction of each institution;
3) provide a fractionalized percentage of the derived estimate for each component, i.e. instruction--75%; academic support--75%, research--50%, and so on;
4) deduct a standard tuition amount per student from the total derived estimate. The estimate of the state's appropriation is, thus, the total derived estimate of each institution's resource requirements minus the adjustments.

To derive the estimate for instruction, several line items are developed. The first line item, instruction base compensation investment, is composed of a faculty investment and a staff investment. Given projected numbers of credit hours and average credit loads per faculty member by program and level, an imputed number of faculty is derived. This number of faculty is then multiplied by an average, peer group salary rate to develop the faculty investment. The number of required staff is derived from a staff/faculty ratio of 1 to 4, and the staff investment is determined by multiplying the resulting number of positions by a salary rate of $13,000. As a second line item for instruction,

the investment for supplies, materials, and equipment is a percentage of the instruction base compensation investment differentiated by program area. The formula for instruction also includes a correction line item for the base year's credit hour projection. The audited credit hours for the base period are divided by the projected credit hours for that period, and this percentage is then multiplied by the base year investment for compensation and for supplies, materials, and equipment. To provide for credit hour growth, where applicable, a rate per base year is derived by dividing the sum of the compensation; supplies, materials, and equipment; and the credit hour correction investments by the audited credit hours for the base period. This rate is then multiplied by the auditor's estimate of credit hour increase for the projected year. A fifth factor to be considered in the instruction component is an institutional complexity investment, which attempts to accommodate differing instructional roles and missions of the institutions. Finally, grants for equipment and program development comprise the sixth element, and this is non-formula derived. The institutional instructional needs is estimated as the sum of these six elements.

Academic support activities are reflected in two investment line items: a base element and program development. The base for academic support is derived as 25.5% of the instruction investment. Program development is based on non-formula grants for the improvement of the library base, for equipment, and for special projects.

Two of the elements of the research component are formula derived. The research base is determined by taking 2% of the FTE faculty supported by state general funds for the base period and multiplying this number of positions by the statewide average faculty compensation. Research capacity is defined as 15% of the non-general fund research expenditures, excluding state-funded research institutes. The investment for the research institutes amounts to 6.5% of the base period expenditures for the institutes plus funds for program changes. Grants for special projects and for projected grant changes are the non-formula derived elements of the investment for program development. The sum of these four items is the research investment.

Public service, although comprised of a variety of elements, is primarily based on the continuing education investment and the broadcast investment. The continuing education investment is determined by deriving a base period cost per credit hour, where the costs are based on the academic support expenditures, and by multiplying the per credit hour rate with the number of participant continuing education units. Broadcast investment is based on fixed amounts for television and radio operations. Amounts for past performance are also considered; 50% of the total for continuing education and broadcasting is multiplied by the relative percentage of the institution's expenditures for community service to the statewide total. The total for continuing education and broadcasting also serve as the basis for the service area investment and the delivery capacity investment, where this base is multiplied for either 12.5% or 37.5%, respectively. Service area investment is then derived on the basis of the percentage of the state population served by the institution, while delivery capacity is derived from the percentage of FTE students. Support for state-sponsored institutes is a non-formula line item for public service.

Student services contains a base investment derived from a formula and an investment for program development based on non-formula derived grants. For the student services base, the base period, fall term headcount enrollment is multiplied by a rate of $150. To this is added an amount based on a rate of $4 per projected credit hour.

Plant operation and maintenance has a specified base of $225,000 plus a percentage amount for inflation. To this is added a factor for the gross area to be maintained; the gross square area times a rate of $1.65. A non-formula derived amount for projected utility expenses is also included. The remaining aspects of institutional support is developed from a complex, weighted formula. The central factor, however, is the current year's general fund expenditures, excluding the amounts for institutional support and research agencies.

Finally, estimates for the health areas of medicine, dentistry, pharmacy, optometry, and veterinary medicine are developed incrementally from the base year expenditures. An overall percentage increase of 6.5% is provided. To this any additional funds required for changes in these programs are added.

Mathematical Representation

1. Instruction

a. [Projected Credit Hours] ÷ [Resource Requirement Indices by Program & Level] = Imputed Number of Faculty

excludes medicine, dentistry, pharmacy, optometry and veterinary medicine (clinical and non-clinical)

b. [Imputed Faculty] ÷ 4 = Number of support personnel for instruction

c. [Imputed Faculty] X [Peer Group Compensation Avg.] = Faculty Investment

d. [Derived Support Personnel] X [$13,000] = Support Personnel Investment

e. Total Instruction Base Compensation Investment = [Projected Faculty Investment] + [Projected Support Personnel Investment]

f. Investment for Supplies, Materials and Equipment = [Total Instruction Compensation] X [Percent Factor for Supplies, Materials and Equipment]

g. Investment Correction for SCH Estimate Error = [Audited Base Period Credit Hours] ÷ [Projected Base Period Credit Hours] X [Total Instruction Base Compensation Investment (Base) + Investment for Supplies, Materials and Equipment (Base)]

h. Investment for Credit Hour Growth where Applicable = [Total steps e through g ÷ Audited Base Period Credit Hours] X [Audit Estimate of Credit Hour Increase]

i. Institutional Complexity Investment = [Investment Variance] X [Weighted Degree Programs Offered]

j. Program Development Investment = [Equipment Grants] + [Program Development Grants]

Sum of e through j equals Total General Fund Estimate of Investment Need for Instruction, exclusive of Health Areas.

2. Academic Support

a. Academic Support Base = [25.5%] X [Instruction Investment]

b. Program Development Investment = [Library Base Improvement Grants] + [Equipment Grants] + [Special Project Grants]

Sum of a and b equals General Fund Estimate of Academic Support Investment Need Exclusive of Health Professions.

3. Research

a. Research Base Investment = [2% X Base General Fund FTE Faculty] X [Base Average Statewide Faculty Compensation]

b. Research Capacity Investment = [15%] X [Non-General Fund Research Expenditures[1]]

[1]excluding state-funded research institutes

c. Research Institute Investment = [Base State-Sponsored Institute Expenditure X 6.5%] + [Program Changes]

d. Program Development Investment = [Base Special Projects Grants] + [Projected Project Grant Changes]

Sum of a through d equals Estimate of General Fund Investment Need for Research.

4. Public Service

a. Continuing Education Investment = [Base Academic Support Expenditure] ÷ [Base Period Credit Hours] X [Base Number of Equated PCEU[1]]

[1]Participant Continuing Education Unit equated to 15 contact hours.

b. Broadcast Investment = [$460,000 for CPB TV] + [$118,000 for CPB Radio] + [$25,000 for Non-CPB Radio]

c. Past Performance Investment = [Continuing Education Investment + Broadcast Investment] X [50%] X [Base Institutional Expenditure for Community Service ÷ Base System Expenditure for Community Service]

d. Service Area Investment = [Continuing Education Investment + Broadcast Investment] X [12.5%] X [Percent of State Population Served]

e. Delivery Capacity Investment = [Continuing Education Investment + Broadcast Investment] X [37.5%] X [Percent of Total FTES Assigned]

f. Institute Investment = [Base State Sponsored Institute Expenditure] + [Program Changes]

(sum of a through f) X (6.5%) = Estimate of General Fund Public Service Investment Need.

5. Student Services

a. Student Services Base Investment = [$150 X Base Fall Term Headcount] + [$4 X Projected Credit Hours]

b. Program Development Investment = [Sum of Special Project Grants]

Sum of a and b equals Estimate of General Fund Student Services Investment Fund.

6. Institutional Support

a. Plant Operation and Maintenance Investment = [Base[1] Investment] + [Gross Area X 1.65] + [Utility Projection]

[1]Base Investment equals $225,000 X 1.065 Inflation

b. **Institutional Support Investment** = [0.535] + [Supported Expenditures^2] X [0.13] - [Supported Expenditures Squared] X [0.0028]

+ [Add on Factor^3]

[2] Supported Expenditures equals current year general fund expenditures (exclusive of institutional support and research agencies) times 1.065 inflation divided by $1,000,000.

[3] If supported expenditures exceed $214,286, then the following added cost X (1,000,000) factor is applied.

[Supported Expenditure - $214,286] X 0.10

Sum of a and b including added cost factor, if applicable, equals Estimate of General Fund Investment Need for Institutional Support.

7. Health Professions

Estimate of General Fund Investment Need for Health Professions = [Base Gross General Fund Expenditures for Medicine, Dentistry, Pharmacy, Ostometry, Veterinary Medicine] X [6.5%] + [Program Changes]

New Mexico

Summary of State Budget Formula (FY 1977-78)

Description

Central to the appropriation formula for institutions in New Mexico is an approach based on staffing standards for faculty workload. Productivity ratios, or the number of credit hours taught by a faculty member, are stipulated for each of 14 disciplines at 3 instructional levels for 2 groupings of institutions on the basis of size. This productivity ratio is then divided into an average historically determined compensation rate for faculty, including salary and fringe benefits, to obtain an average faculty cost per credit hour. To this faculty cost per credit hour is added a per-credit rate to incorporate other direct costs. This other direct cost rate is also based on historical costs. The total direct cost per credit hour is then adjusted to reflect inflationary increases. Projected credit hour production by discipline and level is then multiplied by the direct cost per credit hour rate to determine the instructional expenditures by discipline and level, which are then summed to obtain the total instructional entitlement.

The amount for general support of the institution is determined on a percentage basis. For large institutions, the entitlement for instruction is to represent 56% of the total and for general support, 44%, while for small institutions the percentages are 55% and 45%, respectively. Revenue adjustments: tuition, research overhead, investment earnings, miscellaneous fees, and unrestricted federal funds are subtracted from the total instruction and general expenditures. The adjustments are actual revenue amounts associated with the most recently available data. The residual amount then becomes the recommendation for the state appropriation.

Mathematical Representation

1. Instruction

a. Direct Cost per Credit Hour by Discipline and Level = [Average Faculty Compensation by Discipline, Level & Size] ÷ [Productivity Ratio by Discipline, Level & Size] + [Historical Other Direct Cost Rate by Discipline & Level]

× [Overall Inflationary Factor]

b. Instruction = [Direct Cost per Credit Hour by Discipline & Level] X [Projected Credit Hours]

2. General Support

For large institutions:

General Support = [Instruction ÷ 0.56] - Instruction

and for small institutions:

General Support = [Instruction ÷ 0.55] - Instruction

3. Adjustments

Adjustments = - [Actual Tuition Revenue] -0.20 [Actual Research Overhead Recovery] -0.80 [Actual Investment Earnings]

-(0.55) [Actual Credit Hour] +0.30 [Actual Student Scholarships] + [Actual Amount for NDSL Matching Funds]

Ohio

Summary of State Budget Formula (1977-79 Biennium)

Description

The state budget formula for institutions in Ohio reflects an approach based on actual, historical workload patterns. An overall cost per full-time equivalent student is developed for each of six program groupings: general studies, technical, baccalaureate, masters and professional, doctoral, and medical. Programs are further classified in terms of three possible cost levels on the basis of historical costs per student. As a result of these groupings, 16 program expenditure models are presented, each with an overall cost per student.

The total cost per student is further delineated into five functional categories: departmental instruction and research, academic support, student services, institutional support, and plant operation. Departmental instruction and research is composed of three parts: faculty compensation, other departmental compensation is derived from the average annual compensation for a faculty member which is divided by the historical student-faculty ratio to produce the average faculty compensation per student. The remaining rates per student are based on historical costs, although they are differentially adjusted for inflation.

Mathematical Representation

1. Total Appropriation = Sum of Recommendation [Projected Full-Time Equivalent Enrollment by Expenditure Model] X [Appropriate Rate per Student]

where the rates are given by:

PROPOSED EXPENDITURES PER STUDENT
BY PROGRAM AND LEVEL

PROGRAM	LEVEL	1976-77 BASE	REGENTS' RECOMMENDATION 1977-78	INC.	1978-79	INC.
General Studies	I	$ 1,286	$ 1,466	14.0%	$ 1,558	6.3%
	II	1,536	1,648	7.3%	1,751	6.3%
	III	2,168	2,399	8.6%	2,510	6.4%
Technical	I	$ 1,596	$ 1,809	13.3%	$ 1,920	6.1%
	II	1,816	2,073	14.2%	2,203	6.3%
	III	2,542	2,929	15.2%	3,113	6.3%
Baccalaureate	I	$ 2,074	$ 2,238	7.9%	$ 2,378	6.3%
	II	2,527	2,74[illegible]	8.5%	2,913	6.3%
	III	3,368	3,691	9.6%	3,925	6.3%
Master's & Professional	I	$ 3,268	$ 3,487	[illegible]%	$ 3,706	6.3%
	II	4,929	5,316	[illegible]%	5,648	6.2%
	III	7,835	8,471	[illegible]%	9,005	6.3%
Doctoral	I	$ 4,988	$ 5,395	8.0%	$ 5,720	6.2%
	II	9,152	9,931	8.5%	10,598	6.3%
Medical	I	$ 6,599 *	$ 7,118 *	7.9%	$ 7,570*	6.3%
	II	9,561 *	10,364	8.4%	11,016*	6.3%

* Federal capitation support not included above.

2. For each expenditure model, delineated by program and level, the cost per student is distributed across specific activity categories. An example follows.

PROPOSED EXPENDITURE [illegible]
PER STUDENT

GENERAL STUDIES I

	1977-78	1978-79
A. Departmental Instruction & Research		
1. Faculty Compensation (20/1 student-faculty ratio) Average annual compensation 1977-78 $ 17,758 1978-79 $ 18,823	$ 598	$ 627
2. Other Departmental Compensation	40	42
3. Other Departmental Expense	41	51
Total Departmental Instruction	$ 679	$ 720
B. Academic Support	$ 178	$ 189
C. Student Services	143	154
D. Institutional Support	285	303
E. Plant Operation	171	182
Total Expenditure per FTE Student	$1,466	$1,558

MODEL NO. I

Oklahoma

Summary of State Budget Formula (FY 1977-78)

Description

The budget formula for institutions of higher education in Oklahoma, excluding the special constituent institutions such as the health schools, is based on an historic rate per FTE student, differentiated by discipline and level, and projected FTE enrollment. The rate per student incorporates expenditures related to general instructional support, including library, general administration, general expense, and operation and maintenance of physical plant, and is based on each individual institution's cost history. That portion of the rate associated with instruction is developed, however, using standard student-faculty ratios, differentiated by level, institutional type, and standard faculty salaries by institution type. Support for research and public service is derived from institutional estimates. The Oklahoma formula also makes adjustments to the entitlement by subtracting projected revenues from tuition and related fees, sales and services of educational departments, the federal government, and miscellaneous sources.

Oklahoma's budget formula for the health constituent institutions considers instructional programs and health related libraries on the basis of specific formulas, while the other areas of general administration and expense, continuing education, organized research, and plant maintenance and operation are estimated as incremental budget items. The instructional areas reflect the staffing standard method taken in conjunction with a line item approach, and these are differentiated for each of the programs: medicine, dentistry, nursing, health, graduate college, and pharmacy. Faculty salaries, as a line item, is determined on the basis of projected FTE students, specified student-faculty ratios, and salary rates per position. Other professional salaries are based on a fixed number of positions, dependent on the particular program, and a fixed salary rate, while support staff salaries is based on the number of FTE faculty positions, specified staff-faculty ratios, and standard salary rates. The amount for benefits is derived as a percentage (7%) of the salaries, and other instructional expenses as a percentage (12%) of all salaries and benefits. Library entitlements also reflect, for the most part, the staffing standard method and line item approach. Fixed numbers of professional and support staff and standard

salary rates are specified. Other library expenses are expressed as a percentage (12%) of the salaries and benefits, and the entitlement for books, binding, and printing is 69% of the total for salaries, benefits, and other library expenses. The remaining budget categories of general administration, general expense, continuing education, organized research, and plant maintenance and operation are derived incrementally on the basis of the previous year's budget and a specific percentage increase allowance. Adjustments of the same nature as the non-constituent institutions are made for the Health Sciences Center.

Mathematical Representation (Excluding constituent institutions)

1. General Instructional Support

$$\text{General Instructional Support} = \begin{bmatrix}\text{Projected FTE Enrollment by Discipline \& Level}\end{bmatrix} \times \begin{bmatrix}\text{Rate per Student by Discipline \& Level}\end{bmatrix}$$

where the rates per student take into account resident instruction, organized activities related to instruction. library, general administration, general expense, and operation and maintenance of physical plant. That portion of the cost per student associated with faculty salaries was based on staffing standards for student-faculty ratios and standard faculty salaries.

STANDARD STUDENT-FACULTY RATIOS ANTICIPATED FOR 1977-78

	Comprehensive University	Regional University	2-Year College
Lower:			
Technical	—	12	12
Academic	28	28	28
Upper	20	20	—
Graduate	8	12	—

COMPARATIVE FACULTY SALARIES FOR 1975-76 AND STANDARD FACULTY SALARIES FOR 1977-78

	1975-76 Actual			Standards For 1977-78
	Oklahoma	Regional	National	
Comprehensive Universities	$16,884	$17,954	$17,268	$19,900
Regional Universities	14,293	14,535	16,614	16,500
2-Year Colleges	11,731	13,150	15,830	15,500

2. Research and Public Service program costs are determined from institutional justification.

3. Adjustments are made to the total [illegible] general instructional support, research, and public service by subtracting an amount associated with the projected revenues from tuition and related fees, sales and services of educational departments, the federal government, and miscellaneous sources.

Mathematical Representation (University of Oklahoma Health Sciences Center)

1. Instructional Programs: College of Medicine, College of Dentistry, College of Nursing, College of Health, Graduate College of Medicine and Dental Science, Pharmacy. (The accompanying table summarizes the particular rates and factors.)

   a. Project full-time equivalent enrollment by student classification, if appropriate.

$$\begin{bmatrix}\text{Projected FTE Enrollment}\end{bmatrix} = \begin{bmatrix}\text{Projected Headcount Enrollment by Classification}\end{bmatrix} \times \begin{bmatrix}\text{FTE Factor}\end{bmatrix}$$

   b. $$\begin{bmatrix}\text{FTE Faculty Positions}\end{bmatrix} = \begin{bmatrix}\text{Projected FTE Enrollment}\end{bmatrix} \div \begin{bmatrix}\text{Student Faculty Ratio}\end{bmatrix}$$

   c. $$\begin{bmatrix}\text{Faculty Salaries}\end{bmatrix} = \begin{bmatrix}\text{FTE Faculty Positions}\end{bmatrix} \times \begin{bmatrix}\text{Salary Rate per Position}\end{bmatrix}$$

   d. $$\begin{bmatrix}\text{Other Professional Salaries}\end{bmatrix} = \begin{bmatrix}\text{Number Positions Allowed}\end{bmatrix} \times \begin{bmatrix}\text{Salary Rate per Position } \$32,200\end{bmatrix}$$

   e. $$\begin{bmatrix}\text{Other Support Staff Salaries}\end{bmatrix} = \begin{bmatrix}\text{FTE Faculty Positions}\end{bmatrix} \div \begin{bmatrix}\text{Staff-Faculty Ratio}\end{bmatrix} \times (\$8,000)$$

   f. $$\begin{bmatrix}\text{Staff Benefits}\end{bmatrix} = (0.07)\begin{bmatrix}\text{Faculty Salaries}\end{bmatrix} + \begin{bmatrix}\text{Other Professional Salaries}\end{bmatrix} + \begin{bmatrix}\text{Other Support Staff Salaries}\end{bmatrix}$$

   g. $$\begin{bmatrix}\text{Other Instructional Program Expenses}\end{bmatrix} = (0.12)\begin{bmatrix}\text{Total All Salaries}\end{bmatrix} + \begin{bmatrix}\text{Staff Benefits}\end{bmatrix}$$

	Student Level	FTE Factor	Student-Faculty Ratio	Faculty Salary per Position	Allowed Professionals	Staff-Faculty Ratio
Medicine	Students	1.0	4.6	$30,500	6.0	0.6
	Residents	0.4				
	Physicians	0.4				
Dentistry	Dental	1.0	4.6[a]	$28,300	3.0	1.0
	Hygiene	1.0	12.0	$18,270		
Nursing	Undergraduate	1.0	8.0	$20,700	3.0	0.5
	Graduate	1.0	5.0			
Health	Undergraduate	1.0	12.0	$22,100	3.0	0.5
	Graduate	1.0	8.0			
Pharmacy	Undergraduate	1.0	20.0	$22,100	3.0	NA[b]
	Graduate	1.0	12.0			
Graduate College	Total	1.0	8.0	$26,600	3.0	0.4

[a]Number of dental faculty positions equals 31 plus 1 for every 4.6 FTE dental students above 48.

[b]Number staff positions allowed equals 3.

2. Library

a. $$\text{Total Salaries} = \begin{bmatrix}\text{Number of Allowed Professionals} \\ = 10\end{bmatrix} \times (\$16,000) + \begin{bmatrix}\text{Number of Allowed Support} \\ = 15\end{bmatrix} \times (\$8,000)$$

b. $$\text{Total Compensation} = \begin{bmatrix}\text{Total Salaries}\end{bmatrix} + \begin{bmatrix}0.07 \text{ for Benefits}\end{bmatrix} \begin{bmatrix}\text{Total Salaries}\end{bmatrix}$$

c. $$\text{Other Expenses} = (0.12)\begin{bmatrix}\text{Total Compensation}\end{bmatrix}$$

d. $$\text{Books, Binding, Printing} = (0.69)\begin{bmatrix}\text{Total Compensation}\end{bmatrix} + \begin{bmatrix}\text{Other Expenses}\end{bmatrix}$$

3. The following expense categories are based on the previous year's budget for the given category plus a percentage increase allowance.

Category	Increase
General Administration	7%
General Expense	7%
Continuing Education	10%
Organized Research	10%
Plant Maintenance and Operation	Adjusted for Space and Price Increases

Tennessee

Summary of State Budget Formula (FY 1977-78)

Description

The Tennessee budget formula addresses the categories of instruction, research, public service, academic support, libraries, operation and maintenance of physical plant, and student services with a set of adjustments applied to the formula derived entitlement. The instruction category reflects the workload approach where projected credit hours are multiplied by specified standard rates per credit hour. Both factors are differentiated by program area and level. For those institutions which secured sponsored research grants in excess of $5,000, a percentage of a fixed, statewide fund of $1.5 million set aside for sponsored research is distributed to the institutions. The percentage is based on the institutional amounts secured for sponsored research as a ratio to the statewide amount. Public service activities are derived from base period production of continuing education units. A minimum of $25,000 is provided, and increases for specific ranges of unit production are specified.

For the universities only, 8% of the formula-derived entitlement for instruction, plus institutionally justified amounts, is for academic support and computer services. Library support is based on projected credit hour production and specified rates per credit hour where the credit hours and rates are differentiated by level. A percentage of this amount is then added for acquisitions. The formula for operation and maintenance of physical plant is composed of two line items. Entitlements for both utilities and maintenance are based on the total gross square feet for educational and general space and specific rates per square foot. Institutional support is derived using the total formula and non-formula items, excluding the amount associated with institutional support. Given this amount, one of four formulas is applied depending on the base amount and reflecting institutional size. Student services is based on the projected fall term headcount enrollment multiplied by a rate of $110, plus an amount for intercollegiate athletics. A maximum of $200,000 is set for the universities, and $25,000 for the community colleges. Both staff benefits and student aid are non-formula items.

From the total formula and non-formula entitlements are subtracted various adjustment factors. Included are projected tuition and fee revenues; all governmental appropriations, except those from the state; sales and services of departments; intercollegiate athletic revenues; revenues from other sources; 80% of the recovery of indirect costs; and an amount for a maintenance fee deduction. The maintenance fee deduction factors in the projected credit hour production by level and projected fall term headcount enrollment.

Mathematical Representation

1. Instruction

$$\text{Instruction Expenses} = \begin{bmatrix}\text{Projected Credit Hours by Discipline \& Level}\end{bmatrix} \times \begin{bmatrix}\text{Rate per Credit Hour by Discipline \& Level}\end{bmatrix}$$

where the rates are given by:

Academic Areas	Fresh.-Soph.	Junior-Senior	Master's Professional	Doctoral
Agriculture	$14.46	$22.56	$ 55.09	$112.32
Architecture	16.96	35.54	94.82	--
Area Studies	26.55	23.86	54.83	--
Biological Science	16.86	30.71	82.76	191.99
Business & Management	12.21	17.37	38.49	177.66
Communications	18.87	30.16	74.77	152.51
Computer Sciences	14.46	26.19	49.95	--
Education	18.40	26.99	38.35	90.24
Engineering	30.72	47.28	112.01	248.91
Fine & Applied Arts	24.05	37.47	82.26	--
Foreign Languages	20.43	52.95	99.84	225.12
Health Professions	11.78	33.14	44.03	222.19
Home Economics	13.64	24.31	51.68	78.43
Law	--	--	31.99	--
Letters	13.84	24.97	61.86	108.78
Library Science	6.47	30.28	66.93	--
Mathematics	14.01	29.72	69.15	151.97
Military Science	11.59	13.33	7.78	--
Physical Sciences	19.61	35.33	100.36	209.27
Psychology	8.77	16.60	41.73	74.61
Public Affairs & Serv.	10.88	16.14	63.58	--
Social Sciences	11.52	21.91	57.33	147.76
Interdisciplinary	14.42	51.47	54.83	--
Industrial Technology	25.75	38.97	102.97	83.66
Bus. & Commerce Tech.	13.77	--	--	--
Data Processing Tech.	46.63	--	--	--
Health Ser. & Paramed.	45.14	--	--	--
Mech. & Engr. Tech.	28.11	--	--	--
Natural Sciences Tech.	23.70	--	--	--
Public Service Tech.	10.87	--	--	--

2. Research

If a university secured sponsored research grants totaling over $5,000 in FY 1975-76,

$$\text{Sponsored Research} = [1{,}500{,}000] \times \begin{bmatrix}\text{Base Period Institutional Sponsored Research Fund}\end{bmatrix} \div \begin{bmatrix}\text{Base Period Statewide Total Sponsored Research Funds}\end{bmatrix}$$

3. Public Service

Administrative Allowance = [Base Period Range of Continuing Education Units] as follows

0-2,500	$ 25,000
2,501-7,500	50,000
7,501-12,500	75,000
Above 12,500	100,000

4. Academic Support

For universities only,

Academic Support = [Amount for Instruction] X [0.09]

plus amounts for special institutional requests

5. Libraries

Libraries = [Projected Credit Hours by Level] X [Rate per Credit Hour by Level]

where rates are

Freshman-Sophomore	$1.27 per student credit hour.
Junior-Senior	$2.53 per student credit hour.
Master's	$6.33 per student credit hour.
Law	$7.60 per student credit hour.
Doctoral	$10.13 per student credit hour.

plus an added inflation percentage for acquisitions.

6. Operation and Maintenance of Plant

a. Utilities

Utilities = [Total Gross Square Feet for Educational and General Space] X [Rate per Gross Square Feet]

b. Maintenance

Maintenance = [Total Gross Square Feet for Educational and General Space] + [Total Gross Square Feet for Newly Opened Space] X [Rate per Square Foot]

7. Institutional Support

a. Determine Total Formula plus Non-Formula Expenditures, excluding Institutional Support (Line 1).

b. Apply the appropriate formula:

If Line 1 is $2,000,000 or less:

$\frac{\text{Line 1}}{.85}$ - Line 1 = Total Inst. Support $ _____

If Line 1 is $2,000,000 to $8,000,000:

Let A = Line 1 - $1,760,000

$\frac{A}{.8}$ - A Plus $240,000 = Total Inst. Support $ _____

If Line 1 is $8,000,000 to $16,000,000:

Let A = Line 1 - $7,130,000

$\frac{A}{.92}$ - A Plus $870,000 = Total Inst. Support $ _____

If Line 1 is over $16,000,000:

Let A = Line 1 - $14,780,000

$\frac{A}{.925}$ - A Plus $1,220,000 = Total Inst. Support $ _____

8. Student Services

$$\text{Student Services} = \begin{bmatrix}\text{Projected}\\ \text{Fall Term}\\ \text{Headcount}\\ \text{Enrollment}\end{bmatrix} \times [\$110.00]$$

plus an amount for intercollegiate athletics, with a maximum of $200,000 for universities and $25,000 for community colleges.

9. Staff Benefits: Non-formula item, institutional request.

10. Student Aid: Non-formula item, institutional request.

11. Adjustments

$$\text{Adjustments} = -\left[\begin{matrix}\text{Tuition and}\\ \text{Fee Revenue}\end{matrix}\right] - \left[\begin{matrix}\text{Governmental}\\ \text{Appropriations,}\\ \text{except State}\end{matrix}\right] - \left[\begin{matrix}\text{Sales and}\\ \text{Services of}\\ \text{Educational}\\ \text{Activities}\end{matrix}\right]$$

$$- \left[\begin{matrix}\text{Intercollegiate}\\ \text{Atletics Revenue}\end{matrix}\right] - \left[\begin{matrix}\text{Revenues from}\\ \text{Other Sources}\end{matrix}\right] - (0.80)\left[\begin{matrix}\text{Recovery of}\\ \text{Indirect Costs}\end{matrix}\right]$$

$$- \left[\begin{matrix}\text{Maintenance Fee}\\ \text{Deduction}\end{matrix}\right]$$

$$\text{where Maintenance Fee Deduction} = \left[\begin{matrix}\text{Projected Credit}\\ \text{Hours by Level}\end{matrix}\right] X \left[\begin{matrix}\text{Rate per Credit}\\ \text{Hour by Level}\end{matrix}\right] + (\$21)$$

$$X \left[\begin{matrix}\text{Projected}\\ \text{Fall Term}\\ \text{Headcount}\\ \text{Enrollment}\end{matrix}\right]$$

Texas

Summary of State Budget Formula (1977-79 Biennium)

Description

The Texas budget formula for instruction and departmental research reflects an approach based on staffing standards. In the development of budget for faculty salaries, the largest portion of the instructional budget- a rate per credit hour actually produced during the base period is multiplied by the number of credit hours by discipline and level. The specific rate was derived from FTE student enrollments, prescribed student-faculty ratios, and average salary rates, as well as the credit hour distribution. Also added to the instructional budget is a component for departmental operating expenses which is based on the base period credit hours by discipline and an historically derived rate per credit hour. A third aspect of the instructional budget is a factor for the administrative expenses associated with the Dean's office and is developed as a function of faculty salaries weighted by the level of instruction and average credit hour production.

Funding requests for organized research are developed on the basis of an institutional complexity factor, faculty salaries, and the current fiscal year amount expended for sponsored research. The institutional complexity factor weights FTE enrollments by level and gross discipline categories so that masters and doctoral levels in science and engineering are weighted more heavily than masters and doctoral levels in teacher education, for example. This institutional complexity factor times the amount determined for faculty salaries provides one part of the request for organized research. The formula for organized research also reinforces those institutions which conduct sponsored research by including 5% of the current fiscal year's expenditures for sponsored research. The total entitlement for organized research, according to the formula, is then 70% of the sum of the salary component and the sponsored research component.

The formula also addresses community service and continuing education activities. Productivity related to these activities is summarized in terms of continuing education units, rather than the usual credit hour. The funding level request is then determined by multiplying the number of actual base period continuing education units by $10. The formula, however, stipulates

that the minimum support for these activities is $25,000 and the maximum, $200,000.

Library expenses are derived from the actual credit hours of the base period and specific rates per credit hour delineated by level. The rates increase in amount from the undergraduate ($3.05) to the doctoral ($26.22) so that institutions with graduate and professional schools get a higher level of funding. A minimal amount for library support is also stipulated, $450,000, unless the credit hour level is below 50,000. Under this exception, the base amount is $225,000 plus $9.00 per credit hour in excess of 25,000 credit hours to the previous minimum of $450,000.

For general administration and student services funding, three components are included: headcount enrollment, the actual amount expended for sponsored research, and the total amount appropriated for the past fiscal year for educational and general expenditures, exclusive of this category. Actual fall term headcount enrollments are multiplied by specific rates which reflect the size of the institution and the level of enrollment within the institution. This portion of the formula addresses the economies of scale aspect of this functional category. For example, institutions with an enrollment of less than 4,000 have a $300,000 base for the first 1,000 students plus differential rates for the next two sets of 1,500 students ($131.93 and $90.87, respectively). Institutions again are reinforced for conducting sponsored research. An amount, 7.5% of the actual amounts expended for sponsored research, is included in the appropriation request to cover the costs of administering sponsored research grants and contracts. Finally, 1% of the current fiscal year appropriation for educational and general expenses, excluding the amount for general administration and student services, is included.

Funds for general institutional expenses are based on the base period credit hours. Rates per credit hour are delineated into categories so that the larger the number of credit hours, the higher the rate. For example, the rate per credit hour for the first 200,000 is $1.02 and for the next 200,000, $1.15. A minimum of $110,000 is also established.

Finally, the formula addresses four components of the operation and maintenance of the physical plant: custodial services, building maintenance,

grounds maintenance, and general services. The appropriation request for custodial services is based on the total square feet on the outside dimensions of all educational and general buildings, excluding auxiliary enterprises. These square footage dimensions are then multiplied by an historically derived rate. Building maintenance funds are determined as a function of a maintenance cost factor and the building replacement costs. The maintenance cost factor, expressed as a percentage, reflects the type of building construction: wood-frame, masonry-wood, masonry-concrete, and whether the building is air-conditioned or not. The amount appropriated for maintaining a given building is then some percentage of its replacement cost, depending on the type of construction and air-conditioning status. Grounds maintenance is defined as a function of the linear feet around the perimeters of campus buildings, the number of acres, and the actual fall term headcount enrollment, and general services for the physical plant reflect total full-time equivalent enrollment, actual full time employees, and the replacement cost of the buildings.

Mathematical Representation

1. Instruction, Departmental Operating Expense, Instructional Administration

   a. Instruction or Faculty Salaries

$$\text{Faculty Salaries} = \begin{bmatrix}\text{Base Period Credit Hours by Program \& Level}\end{bmatrix} \times \begin{bmatrix}\text{By Program \& Level Rate Per Credit Hour}\end{bmatrix}$$

   where the rates are based on historical costs per credit hour unit:

$$\begin{bmatrix}\text{Base Credit Hours by Program \& Level}\end{bmatrix} \div [30] \div \begin{bmatrix}\text{Stipulated Student-Faculty Ratio by Program \& Level}\end{bmatrix} \times \begin{bmatrix}\text{Standard Average Faculty Salary by Discipline Adjusted for Inflation}\end{bmatrix} \div \begin{bmatrix}\text{Base Credit Hours by Discipline \& Level}\end{bmatrix}$$

   b. Departmental Operating Expense

$$\text{Departmental Operating Expense} = \begin{bmatrix}\text{Base Period Credit Hours by Program \& Level}\end{bmatrix} \times \begin{bmatrix}\text{by Program \& Level Rate per Credit Hour}\end{bmatrix}$$

   c. Instructional Administration

      i) Determine a weighting factor for level of instruction.

$$\text{Level Weight} = \begin{bmatrix}5.0, \text{ if undergraduate}\end{bmatrix} + \begin{bmatrix}0.2, \text{ if Masters}\end{bmatrix} - \begin{bmatrix}0.8, \text{ if Doctoral}\end{bmatrix} + \begin{bmatrix}2.2, \text{ if Professional}\end{bmatrix}$$

      ii) Determine average undergraduate ($\overline{USCH}$), graduate ($\overline{GSCH}$), and professional ($\overline{SPSCH}$) base period credit hours by dividing the actual base period credit hours by the number of approved colleges, schools, or divisions.

      iii) Determine a weighting factor for credit hours. If $\overline{USCH}$ and $\overline{GSCH}$ exceeds 21,000 and $\overline{SPSCH}$ exceeds 3,000:

$$\text{Credit Hour Weight} = [0.690 + 0.000007(\overline{USCH})] + [0.190 - 0.000008(\overline{GSCH})] + [0.204 - 0.000002(\overline{SPSCH})]$$

      Otherwise:

$$\text{Credit Hour Weight} = [0.690 + 0.00004(\overline{USCH})] + [0.190 - 0.000001(\overline{GSCH})] + [0.204 - 0.000076(\overline{SPSCH})]$$

iv) Instructional Administration = [Level Weight] - [Credit Hour Weight] X [Faculty Salaries]

2. Organized Research

Organized Research = {[Institutional Complexity Factor] X [Faculty Salaries] + [0.05] [Base Amount Expended for Sponsored Research]} X [.70

where the Institutional Complexity (IC) Factor shall be computed as follows:

$$IC = \frac{0.015U + (0.50M_1 + 0.10M_2 + 0.25M_3) + (6D_1 + 1D_2 + 3D_3)}{U + M + D}$$

where

U = Undergraduate FTSE
M = Masters FTSE

M_1 = Masters FTSE in Science and Engineering

M_2 = Masters FTSE in Teacher Education

M_3 = Masters FTSE in all other programs

D = Doctoral FTSE

D_1 = Doctoral FTSE in Science and Engineering

D_2 = Doctoral FTSE in Teacher Education

D_3 = Doctoral FTSE in all other programs

Determine full-time student equivalents (FTSE) at all levels by dividing the base period semester credit hours by 30.

3. Community Service and Continuing Education

Service & Continuing Education = [Base Period Continuing Education Units] X ($10)

with a minimum of $25,000 and a maximum of $200,000

4. Library

$$\text{Library} = \begin{bmatrix}\text{Base Period Credit}\\ \text{Hours by Level}\end{bmatrix} \times \begin{bmatrix}\text{Rate by Level}\\ \text{per Credit Hour}\end{bmatrix}$$

where, for example, the rates are:

Level	Rate
Undergraduate	$ 3.05
Masters	6.13
Special Professional	6.13
Law	6.18
Doctoral	26.22

With a minimum of $450,000 unless total credit hours are below 50,000 when the amount shall be $225,000 plus $9.00 per credit hour in excess of $25,000 to the minimum of $450,000.

5. General Administration and Student Services

$$\text{General Administration \& Student Services} = \begin{bmatrix}\text{Base Fall}\\ \text{Headcount}\end{bmatrix} \times \begin{bmatrix}\text{Appropriate Rate}\\ \text{per Headcount in}\\ \text{Size of Institution}\end{bmatrix} + (0.075)\begin{bmatrix}\text{Base Amount}\\ \text{Expended for}\\ \text{Sponsored}\\ \text{Research}\end{bmatrix}$$

$$+ (0.01)\begin{bmatrix}\text{Base Period Total}\\ \text{Educational and}\\ \text{General Appro-}\\ \text{priation}\end{bmatrix} - \begin{bmatrix}\text{Amount for General}\\ \text{Administration and}\\ \text{Student Services}\end{bmatrix}$$

where, for example, the appropriate enrollment rates are, for institutions with Fall term headcount enrollments of 4,000 or more:

Enrollment	Rate
First 4,000	$158.55
Next 4,000	118.27
Above 8,000	106.56

or for institutions with Fall term headcount enrollments of less than 4,000:

Enrollment	Rate
First 1,000	$300,000 Base
Next 1,500	$131.93
Next 1,500	90.87

6. Institutional Support

$$\text{Institutional Support} = \left[\text{Actual Base Period Credit Hours}\right] \times \left[\text{Rate per Credit Hour}\right]$$

where the rate, for example, are:

Credit Hours	Rate
First 200,000	[illegible]
Next 200,000	1.15
Next 200,000	1.27
Over 600,000	1.39

with a minimum of $110,000.

7. Operation and Maintenance of Plant

a. Custodial Services

$$\text{Custodial Services} = \left[\text{Total Square Feet for Outside Dimensions of Educational \& General Build}\right] \times [\$0.5358]$$

b. Building Maintenance

$$\text{Maintenance} = \left[\text{Maintenance Cost Factor}\right] \times \left[\text{Building Replacement Costs}\right]$$

where maintenance cost factor is:

	Type of Construction		
	Wood-Frame	Masonry-Wood	Masonry-Concrete
Air Conditioned	1.90	1.45	1.25
Non-Air Conditioned	1.75	1.30	1.10

which is expressed as a percentage.

c. Grounds Maintenance

$$\text{Grounds Maintenance} = \left[\text{Average Hourly Earnings for Services}\right]\left\{0.70\left[\text{Total Linear Feet of Perimeter of Campus Buildings}\right] + 122\left[\text{Total Number of Acres: Lawns \& Maintained Areas}\right] + 0.50\left[\text{Base Fall Headcount Enrollment}\right]\right\}$$

d. Physical Plant General Services

$$\text{General Services} = \left[\text{Average Hourly Earnings for Services}\right]\left\{\left[\text{Base Period FTE Enrollment}\right] + (2)\left[\text{Base Period FTE Employees Eligible for Retirement}\right] \times 3.90\right\}$$

$$+ 0.0028 \left[\text{Replacement Cost of Buildings}\right]$$

with a minimum of $106,000.

Virginia

Summary of State Budget Formula (1978-80 Biennium)

Description

The state budget formula for Virginia, with the exception of the library component, reflects a staffing standard approach where the entitlement is based solely on the number of positions determined. Each of the areas addressed by the formula: instruction, academic support, library, student services, institutional support, and operation and maintenance of plant, specifies the criteria for deriving the number of positions and derives the entitlement by multiplying the number of positions by an institutional average salary. Instructional faculty positions are based on the projected FTE enrollment and stipulated student-faculty ratios, both differentiated by program and level. Instructional staff requirements, on the other hand, are determined from the derived instructional faculty positions using various staff-faculty ratios. Academic support personnel are derived in a similar manner, although different ratios are provided for the doctoral granting universities and the remaining comprehensive colleges, liberal arts colleges, and specialized institutions. The other formula components: library, student services, and institutional support, also differentiate by these two categories of institutions. The number of positions, however, is comprised of a base number and a number derived from either enrollment, the number of faculty positions, or both. The number of positions for operation and maintenance of plant is institutionally justified, except for general guidelines where the total number of requested positions is not allowed to exceed base period ratios.

Only in the library component are additional factors, other than personnel, considered. For doctoral granting institutions meeting the Association of Research Libraries membership criteria, the Voight Formula is used to determine the volume (books and periodicals) needs; the entitlement is then the number of volumes multiplied by a standard rate. The Voight Formula provides a volume base to which are added stipulated numbers of volumes, broken down by level and, within the graduate level, by program area. Additions are also provided for the support of sponsored research and for an access factor. Program deletions are reflected in a subtracted volume. All other institutions use the Virginia Maintenance Formula. The formula provides a fixed entitlement which is modified by total program, program magnitude, and enrollment weights. The total program

weight is derived from weights assigned to program areas attributed to the institution and is contingent on the institution's unique program offerings at the undergraduate, master's, and doctoral levels. The program magnitude weight is based on the number of authorized programs offered at least level, where the master's level is weighted by 2 and the doctoral by 4. Given the number of adjusted programs, different programmatic weights, from 0.85 to 2.00, are assigned to specific ranges of numbers of programs. The enrollment is also weighted to differentiate among the levels: lower level undergraduate - 1.0, upper level undergraduate - 1.5, master's - 3.0, and doctoral - 4.5, which is then divided by the unweighted enrollment to derive the enrollment weight. The Library entitlement under the Virginia Maintenance Formula is then found by multiplying these three weights by the fixed base amount.

Mathematical Representation

1. Teaching and Research Instructional Positions

   a. General Academic Instruction

$$\text{Number of Positions General Academic} = \left[\begin{array}{l}\text{Projected FTE Enrollment by Discipline \& Level}\end{array}\right] \div \left[\begin{array}{l}\text{Student-Faculty Ratio by Discipline \& Level}\end{array}\right]$$

where the ratios, for example, are:

Specific Discipline Division	Level and Discipline Divisions by Course: Lower	Upper	First Professional	Graduate
Agriculture (01XX)	1:16	1:11	xx	xx
Arch. & Env. Design (02XX)	1:16	1:11	xx	xx
Engineering (09XX)	1:16	1:11	xx	xx
Fine & Applied Arts (10XX)	1:16	1:11	xx	xx
Foreign Languages (11XX)	1:16	1:11	xx	xx
Health - General (12XX)	1:10	1:8	xx	1:6
Medicine (1206)	xx	xx	1:2	xx
Dentistry (1204)	xx	xx	1:3.8	xx
Law (1401)	xx	xx	1:20	xx
Business and Commerce (50XX) Data Processing (51XX) & Public Service Technologies (55XX)	1:15	xx	xx	xx
Health Service and Paramedical Technologies (52XX)	1:10	xx	xx	xx
Mechanical and Engineering (53XX) & Natural Science Technologies (54XX)	1:12	xx	xx	xx
Foundation Courses	1:15			

   b. Off-Campus Instruction

$$\text{Number of Positions Off-Campus Instruction} = \left[\begin{array}{l}\text{Projected F.E Off-Campus Enrollment by Discipline \& Level}\end{array}\right] \div \left[\begin{array}{l}\text{Student-Faculty Ratio by Discipline \& Level}\end{array}\right]$$

where the student-faculty ratio is selcted as the larger of the previous year's off-campus instruction actual ratio or that provided by the guidelines.

c. Summer Session Instruction

$$\text{Number of Positions Summer Session Instruction} = \left[\begin{array}{l}\text{Projected FTE Summer Session Enrollment by Discipline \& Level}\end{array}\right] \div \left[\begin{array}{l}\text{Student-Faculty Ratio by Discipline \& Level}\end{array}\right]$$

where the student-faculty ratio is selected as the larger of the previous year's summer session instruction actual ratio or that provided by the guidelines.

2. Classified Positions for General Academic Instruction, Off-Campus Instruction, Summer Session Instruction and for Academic Administration, Personnel Development, and Course and Curriculum Development.

a. Doctoral Granting Institutions

$$\text{Number of Classified Positions} = \left[\begin{array}{l}\text{Number of FTE Teaching \& Research Instructional Positions}\end{array}\right] + \left[\begin{array}{l}\text{Number of FTE Teaching \& Research Positions for Institutional Academic Administration, etc.}\end{array}\right] \div 4$$

b. Comprehensive Colleges, Liberal Arts Colleges, and Specialized Institutions

$$\text{Number of Classified Positions} = \left[\begin{array}{l}\text{Number of FTE Teaching \& Research Instructional Positions}\end{array}\right] + \left[\begin{array}{l}\text{Number of FTE Teaching \& Research Positions for Instructional Academic Administration, etc.}\end{array}\right] \div 8$$

After determining the appropriate number of classified positions, the institution then distributes at its discretion the positions to the various subprograms

3. Teaching and Research Administrative Positions for General Academic Instruction, Off-Campus Instruction, Summer Session Instruction and for Audio/Visual Services, Computing Support, Academic Administration, Personnel Development, and Course and Curriculum Development.

a. Doctoral Granting Institutions

$$\text{Number of Teaching \& Research Administrative Positions} = \left[\begin{array}{l}\text{Number of FTE Teaching \& Research Instructional Positions}\end{array}\right] \div [20]$$

b. Comprehensive Colleges, Liberal Arts Colleges, and Specialized Institutions

$$\text{Number of Teaching \& Research Administrative Positions} = \left[\text{Number of FTE \& Teaching Research Instructional Positions}\right] \div [35]$$

4. Library

a. Classified and Teaching and Research Administrative Positions

1) Doctoral Granting Institutions

$$\text{Number of Positions} = \left[\text{Base of 9 FTE Positions}\right] + \left[\text{1 per 400 undergraduate (Academic and Summer) FTE Students}\right]$$

$$+ \left[\text{1 per 100 Graduate \& Professional FTE Students}\right] + \left[\text{1 per 35 FTE Teaching \& Research Instructional Positions}\right]$$

for institutions not satisfying current membership criteria of the Association of Research Libraries

ii) Comprehensive Colleges, Liberal Arts Colleges, and Specialized Institutions

$$\text{Number of Positions} = \left[\text{Base of 9 FTE Positions}\right] + \left[\text{1 per 400 FTE Students}\right] + \left[\text{1 per 400 FTE \& Teaching Research Instructional Positions}\right]$$

b. Equipment

1) Doctoral Granting Institutions meeting the Association of Research Libraries membership criteria use the Voigt Formula to determine volume (books and periodicals) needs.

$$\text{Maintenance} = [\text{Number of Volumes}] \times \$19.65$$

CALCULATION OF MAINTENANCE FUNDING BASED ON
WOLFE FORMULA

Factors	1978-79	1979-80
a. Volume Base	40,000	40,000
b. Program Subtractions	( )	( )
c. Grad. Program Additions:		
Foreign Literatures		
Social Sciences		
Earth Science, Astronomy		
d. Grad. School Additions		
Agriculture..... 3,000		
Architecture..... 1,000		
Art..... 3,000		
Business Administration.. 2,000		
City and Regional Planning..... 2,000		
Drama..... 2,000		
Education..... 3,000		
Engineering..... 1,000 per major area 4,000 maximum		
Law..... 8,000		
Library Science..... 1,000		
Medicine..... 8,000		
Medicine Related Professions..... 1,000 per major area 4,000 maximum		
Music..... 3,000		
Oceanography..... 3,000		
Religious Studies..... 2,000		
Social Welfare..... 1,000		
Veterinary Science..... 3,000		
e. Undergraduate Supplement		
f. Sponsored Research Addition		
g. Access Factor Addition		
h. Total - Additional Volumes		
i. Per Volume Cost	$19.65	$20.80
j. Total - Maintenance Funding		

ii) All other institutions use the Virginia Maintenance Formula.

a) Compute the program level weights by using the following table and applying the appropriate weight for each approved program at each level.

CALCULATION OF PROGRAM WEIGHTS BY LEVEL

Indicate year for which calculation is made: 1978-79 _____
Provide a separate calculation for each year of the Biennium. 1979-80 _____

HEGIS CODE	PROGRAM DESCRIPTION	WEIGHT	LEVEL OF OFFERING: BACHELOR	MASTERS	DOCTORAL
0400	Ag. & Nat. Res.	.030			
0200	Architecture	.150			
	0301-0314 each, add	.010			
0400	Biology	.409			
0500	Business	.139			
0600	Communications	.056			
0700	Computer & Info. Sci.	.085			
0800	Education	.301			
0900	Engineering	.750			
1000	Fine Arts	.108			
	1002-1003 Art, add	.349			
	1004-1006 Music, add	.166			
1100	Mod. For. Lang.	.192			
	1102-1199 each, add	.020			
1200	Health Prof.	.085			
	1203, Nursing, add	.070			
1300	Home Econ.	.041			
1500	Letters	1.000			
	1504 Classics, add	.017			
	1506 Speech, add	.030			
	1508 Philosophy, add	.146			
	1510 Religious Stud., add	.347			
1600	Lib. Science	.055			
1700	Math.	.264			
1900	Phys. Sci.	.855			
	1902-1904, Physics, add	.212			
	1905-1910, Chem., add	.333			
	1914-1918, Geol., add	.227			
	1919, Oceanog., add	.280			
2000	Psych.	.257			
2100	Pub. Affairs	.085			
2200	Soc. Sci.				
	2202, Anth-ap., add	.897			
	2204, Econ., add	.304			
	2205, Hist., add	.988			
	2206, Geog., add	.029			
	2207, Poly Sci. & Gov., add	.404			
	2208-2299, Soc., add	.944			
General Component		2.305	2.305		
TOTAL					

b) Total Program Weight = [Bachelor's Weight] + [Master's Weight] + (2) [Doctoral Weight]

c) Adjusted Number of Programs = [Number of Bachelor's Programs] + (2) [Number of Master's Programs] + (4) [Number of Doctoral Programs]

If the adjusted number of programs =

1	-	25,	Program Magnitude Weight = 0.80
26	-	50,	Program Magnitude Weight = 0.85
51	-	75,	Program Magnitude Weight = 0.90
76	-	100,	Program Magnitude Weight = 0.95
101	-	200,	Program Magnitude Weight = 1.00
200	+	,	Program Magnitude Weight = 2.00

d) Funding Base = [Total Program Weight] X [Program Magnitude Weight] X ($15,095)

e) Enrollment Weight = {[Lower Level FTE Students] + (1.5) [Upper Level FTE Students] + (3) [Master's FTE Students] + (4.5) [Doctoral FTE Students]} ÷ [Total FTE Students]

f) Total Maintenance Funding = [Funding Base] X [Enrollment Weight]

5. Student Services

a. Classified Positions

Number of Classified Positions = [Base of 2 FTE Positions] + [22.5 per 100 Teaching & Research Academic Instruction Positions]

b. Teaching and Research Administrative Positions

Number of Teaching & Research Administrative Positions = [Base of 2 FTE Positions] + [2.75 per 1000 Academic & Summer Sessions FTE Students]

6. Executive Management, Fiscal Operations, General Administrative Service, and Public Relations and Development

a. Classified Positions

Number of Classified Positions = [Base of 4 FTE Positions] + [22.5 per 100 Teaching & Research Academic Instructional Positions]

b. Teaching and Research Administrative Positions

1) Doctoral Granting Institutions

Number of Teaching and Research Administrative Positions = [Base of 3 FTE Positions] + [2.75 per 1000 Academic & Summer Sessions FTE Students]

ii) Comprehensive Colleges, Liberal Arts Colleges, and Specialized Institutions

Number of Teaching & Research Administrative Positions = [Base of 3 FTE Positions] + [3.00 per 1000 Academic & Summer Sessions FTE Students]

7. Administrative Data Processing

a. Classified Positions

Number of Classified Positions = [Base of 2 FTE Positions] + [22.5 per 100 Teaching & Research Academic Instruction Positions]

b. Teaching and Research Administrative Positions

Number of Teaching & Research Administrative Positions = [Base of 2 FTE Positions] + [2.75 per 1000 Academic & Summer Sessions FTE Students]

8. Logistical Services

Institutional request for positions may not exceed the ratio of Classified Positions for Logistical Services to Fall Headcount for the year ending June 30, 1977.

9. Operation and Maintenance of Plant

a. Administration and Supervision

Institutional request for positions may not exceed the ratio of Classified Positions for Administration and Supervision to the Total Classified Positions for Operation and Maintenance of Plant for 1976-77.

b. Operation of Power Plant

Institutional justification

c. All Other Subprograms

Institutional request for positions may not exceed the ratio of Classified Positions for All Other Subprograms to the total number of educational and general assignable and non-assignable square feet for 1976-77.

Washington

Summary of State Budget Formula (Recommended)

Description

Although Washington currently has a budget formula in operation, the formula presented here represents the recent recommendations for revising the existing formula. These recommendations, however, have not been fully accepted, and work is continuing on the development of the formula. The major recommendation is the change to standard, statewide costs and salaries, rather than using institutionally derived averages throughout the budget categories.

The instruction formula takes a line item approach, considering faculty salaries separately from other operating expenses. As recommended, the faculty salary entitlement is determined by deriving the projected number of faculty positions required, based on projected credit hours and stipulated credit hour loads per faculty differentiated by level, and then by multiplying the number of positions by a standard salary rate. The operating expenses entitlement reflects staff salaries, as well as other departmental expenses, and is projected on the basis of projected credit hours and specific rates per credit hour, both differentiated by level.

The library budget formula of Washington reflects two distinct budget line items: staffing salaries and binding, and library resource and acquisition. With regard to meeting staffing needs, the formula provides for a minimum of FTE staff positions to which are added positions as related to FTE enrollment and FTE faculty positions. Washington's library formula, which involves four student levels, weights the enrollments by factors of 1.0, 2.0, 4.0, and 6.0, which has the effect of allowing more positions for higher student levels. In addition to the enrollment factors, the Washington formula, as recommended, also takes into account the number of FTE faculty and staff, a weight for maintenance of the current collection, and a weight for new acquisitions. From these factors the number of required positions is derived, and the library staffing salary entitlement is computed by multiplying this number by a standard amount. For library resource and acquisition, the approach taken is to determine the number of volumes and to multiply this volume by a standard rate per volume. Determination of the number of volumes takes into account

several factors: a volume base; program additions, taking into account area; and sponsored research adjustments. Also addressed are changes in student enrollment, faculty changes, and a replacement adjustment. As a final consideration to the library budget formula, a separate line item for binding is included. This formula takes in account the current subscription rate, which is multiplied by a rate of 1.2 to allow for binding and rebinding. The resulting weighted subscription is then multiplied by a standard dollar amount to obtain the entitlement for binding.

The formula for student services multiplies standard unit rates by the projected number of units and includes as factors: admission applications, full-time and part-time student headcount enrollment by level, residency hall occupancy, and active placement file size. In addition, non-formula amounts for special minority affairs and disadvantaged student program expenditures are added.

Finally, in the area of operation and maintenance of the physical plant, four line items are considered. Building maintenance is represented as a function of the replacement cost of the building multiplied by a building factor which is delineated by type of construction and whether it is air conditioned. Janitorial services entitlement reflects two distinct categories: salaries and operations. In determining the salary entitlement, the total square feet served is divided by a standard rate per FTE staff ($20,000) to which is added any institutionally justified adjustments. The resulting number of positions is then multiplied by a standard salary rate. Operations entitlement is determined on the basis of a standard rate per man-year and the man-year entitlement. The staffing standard method is also used for estimating the salary component of the grounds maintenance. The number of required positions is determined as a function of the number of acres, where the acres are categorized into four types of acreage, such as lawns or paved areas. A standard number of acres per man year by category is divided into the acres to determine the number of required positions, to which numbers of institutionally justified positions are added. The total number of positions is then multiplied by a standard salary rate. The operations entitlement for grounds maintenance is estimated by multiplying the number of acres by category by a standard rate per category.

To estimate the utility maintenance entitlement, the amount derived as the building maintenance entitlement is multiplied by a standard rate. Non-formula items for administration; police, fire, and safety; and trucking services are also added into the operation and maintenance entitlement.

Mathematical Representation

1. Instruction

a. Faculty Position = [Credit Hours Projected by Level] ÷ [Stipulated Credit Hour per Faculty by Level]

Faculty Salaries = [Total Faculty Positions] X [Institutional Average Faculty Salary]

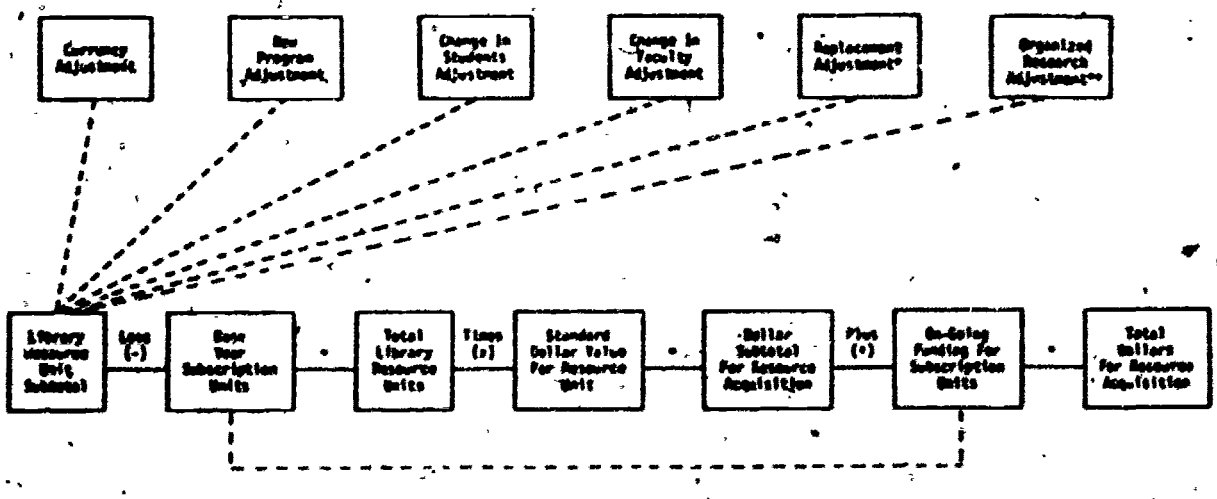
b. Other Operating Expenses = [Credit Hours Projected by Level] X [Rate per Credit Hour by Level]

2. Libraries

a. Library Resources

EXHIBIT I

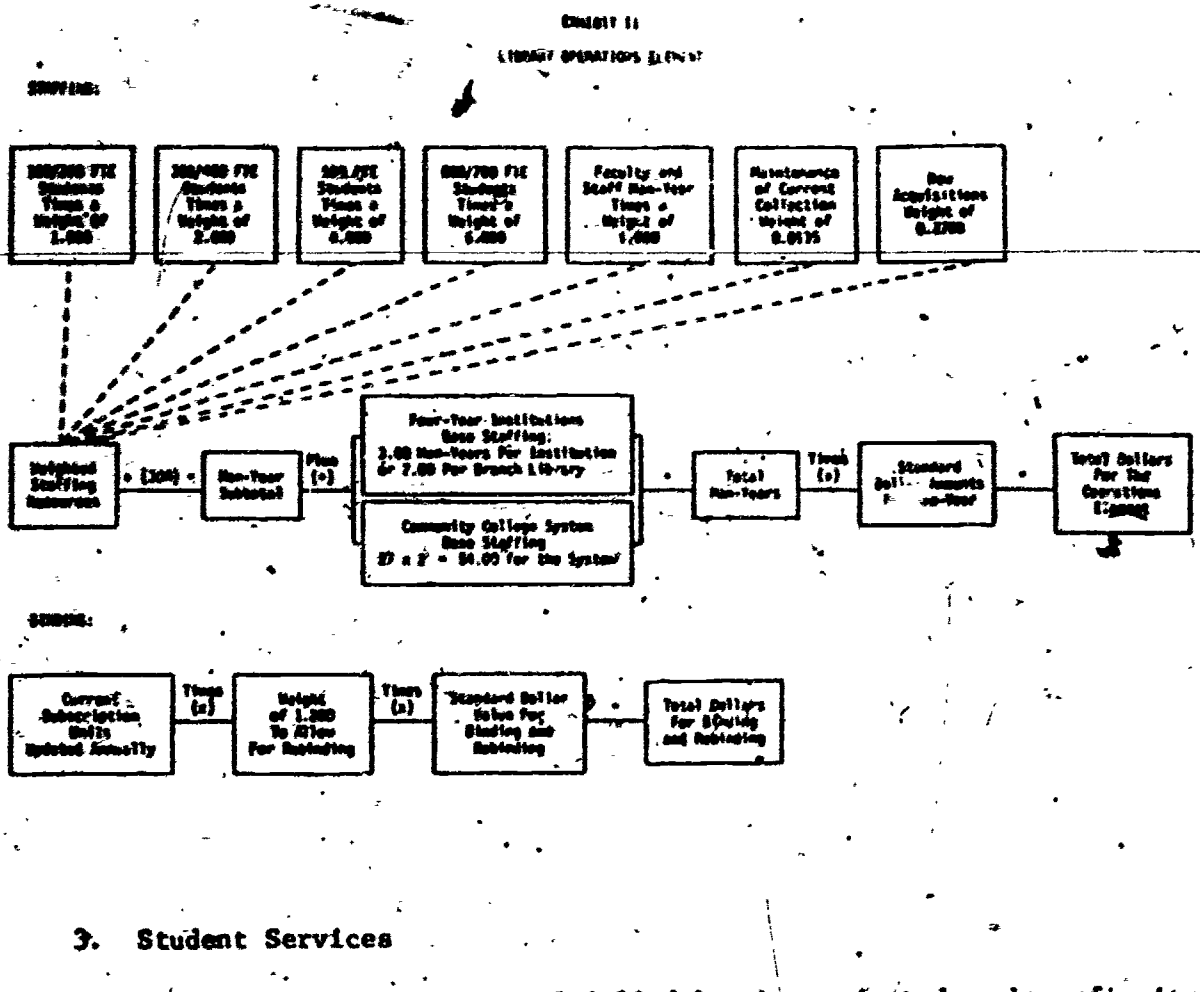
LIBRARY RESOURCES ELEMENT



*Based on the following: 0.0000 times their current total holdings for each of the universities.
0.0000 times their current total holdings for each of the state colleges.
0.0000 times the current total holdings for the community college system.

**Based on 1,000 resource units per $15 million of projected organized research expenditures.

b. Library staffing and Binding



3. Student Services

Standard unit rates are multiplied by the projected number of units:

For each weighted application for admission	$ 19.75
For each lower division full-time student	$137.75
For each upper division full-time student	$162.25
For each post-baccalaureate full-time student	$165.00
For each part-time student (six or less hours)	$ 59.25
For each bed in institutionally controlled residency halls planned for occupancy	$ 47.75
For each former student with an active placement file	$ 40.50

plus non-formula amounts for special minority affairs and disadvantaged student program expenditures.

4. Operation and Maintenance

a. Building Maintenance

$$\text{Building Maintenance Entitlement} = \left[\text{Building Factor}\right] \times \left[\text{Replacement Value}\right]$$

where the building factor is delineated by type of construction (masonry, masonry/wood, and wood frame) and air conditioning.

Janitorial Services

$$\text{Salaries} = \left\{\left[\text{Total Square Footage Served}\right] \div [20{,}000] + [\text{Adjustments}]\right\} \times \left[\text{Standard Salary Rate}\right]$$

$$\text{Operations} = \left[\text{Man Year Entitlement}\right] \times \left[\text{Standard Cost } \$850\right]$$

c. Grounds Maintenance

$$\text{Salaries} = \left\{\left[\text{Number of Acres by Category Maintained}\right] \div \left[\text{Standards for Each Category}\right] + [\text{Adjustments}]\right\} \times \left[\text{Standard Salary Rate}\right]$$

where acre category and standards are:

Category	Acres / Man Year
I	4
II	8
III	16
IV	32

$$\text{Operations} = \left[\text{Number of Acres by Category}\right] \times \left[\text{Rate per Acre}\right]$$

where the rates are:

Category	Rate
I	1.0
II	1.0
III	2.0
IV	0.5

d. $\text{Utility Maintenance} = \left[\text{Building Maintenance}\right] \times [\$10]$

plus non-formula amounts for utilities; administration; policy, fire, and safety; and trucking services.