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ABSTRACT

Because the Colleges of Applied Arts and Technology (CAATS) of Ontario are largely dependent on the Ontario Government for financial support, it is important to justify their level of expenditure, and prove that allotted public funds are effectively and efficiently managed. After a brief discussion of the existing resource allocation process in Ontario, this paper explores various formula financing systems. Cost plans used by various states in the United States for financing higher education are examined in detail. Traditionally, per student program costs are arrived at through an itemized examination of the budget or financial statement of the particular college. The financing formula system proposed for CAATS is based on an analytical process that focuses primarily on such variables as teaching methods, administrative policies, and institutional characteristics. The basic purpose of the study is to develop objective information regarding the cost of a range of reasonable program alternatives in different institutions. (AF)

THE PROS AND CONS OF EXISTING FORMULA FINANCING SYSTEMS AND A SUGGESTED NEW APPROACH

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TABLE OF CONTENTS

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1. INTRODUCTION

During the current year the Colleges of Applied Arts and Technology (CAATS) of Ontario are expected to receive approximately $100 million in operating and capital grants from the provincial government to provide education to approximately 60,000 full-time and part-time students. Clearly, the CAATS are playing an increasingly larger role in the post-secondary education system of Ontario. At the same time, it is becoming increasingly more important that the CAATS are able to demonstrate to the Government and people of Ontario:

(1) that the level of expenditures on the CAATS is justified in view of competing needs in areas such as primary and secondary education, universities, health, welfare, economic development, etc.; and

(2) that the public funds allocated to the CAATS are managed efficiently and effectively.

The problem of financing higher education is a very sensitive one. It concerns the interface of education and government. Traditionally, education and government maintained a respectful distance. This was possible because education was privately financed. The CAATS, however, are largely dependent on the Ontario Government for financial support.

In view of this problem, it is important to understand the existing process of resource allocation and to explore ways and means to improve it.

2. THE EXISTING RESOURCE ALLOCATION PROCESS

Currently, the Ontario Legislature allocates funds

for the CAATS through one appropriation (Vote 505) which also includes funds for adult training and Ryerson Polytechnical Institute. Subsequent to the formal appropriation, the Department of Education allocates the funds to the various colleges. The Colleges then prepare their own internal budgets.

There are, thus, three distinct levels on which resource allocation decisions are made:

(1) the Government of Ontario;
(2) the Department of Education, and
(3) the individual college.

How are decisions arrived at on each level? Five distinct steps may be identified:

(1) on April 1 of each year the Department of Education submits a long-term forecast of departmental revenues and expenditures to the Treasury Board. The forecast is based on its own projections of the level of activity in each of the programs which come within the jurisdiction of the Department.

(2) all Departmental forecasts are consolidated and reviewed by Cabinet and its committees during the summer in light of revenue projection, the economic condition of the province and political priorities. The review results in the establishment of basic policy directions and budgetary guidelines for all the departments.

(3) on September 1 the CAATS submit to the Department of Education a preliminary budget estimate. The estimate is based on the current budget, adjusted for changes in wages, prices and enrolment.

(4) on October 1, the Department of Education submits its departmental budget estimates to the Treasury Board. The estimates are based on the submissions of the Colleges adjusted in light of the budgetary guidelines set by the Cabinet as a result of the review of the long-term forecast.

(5) the Treasury Board and the Cabinet review all departmental estimates and construct the final budget to be submitted to the Legislature in March or April of each year.

In the absence of a working formula financing scheme the Department of Education and the Treasury Board Secretariat are each using their own methods and standards to analyze line item submissions from the CAATS.

SOME OBSERVATIONS:

(1) the Department of Education is presently in a position where it has to prepare long-range forecasts without the benefit of a direct input from the CAATS.

(2) the preliminary budgets submitted by the CAATS to the Department of Education often arrive late and after the Department is required to submit its estimates to the Treasury Board (October 1).

(3) unless the CAATS are able to demonstrate their need for resources, both long-term and short-term, more effectively than has been done to date, they must be prepared to lose out in the vigorous competition for the limited tax dollar.

(4) both, the Treasury Board and the Department of Education would prefer it if the CAATS could agree on a formula for the equitable distribution of funds to the CAATS in general and each college in particular.

3. SOME FORMULA FINANCING SYSTEMS

In recent years, various jurisdictions have developed formula financing schemes. The system for Ontario universities, for example, is based on actual enrolment in various programs weighted on a scale from one to six. The total weighted enrolment determines the number of basic income units to be awarded to individual universities. The value of the basic income unit is determined by the Government in light of available resources.

A number of States in the U.S. have developed formula financing schemes. It is instructive to note the various approaches that have been taken in California, Florida, Kentucky, Oklahoma, Tennessee and Texas. (1)

Two types of formulas may be identified: base formulas and functional formulas. Both types differentiate the major

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(1) The following is an adaptation from:

Miller, James A. Sr., State Budgeting for Higher Education, Institute of Public Administration, The University of Michegan, Ann Arbor, 1964, Chapter V, "Procedures Used in Selected States," pp. 94 - 150

functional areas within the college such as instruction, library, administration and operation and maintenance of physical plant. In a base formula, the direct expenditures of institutions are termed "base" expenditures and expenditures for other activities are dealt with as percentages of this base ... In a functional formula anticipated expenditures for each activity are determined through a consideration of factors directly relevant to the activity itself.

Oklahoma uses a strict base formula, California and Texas have functional formulas and Florida and Kentucky and Tennessee,use a mixture of the two. Following are brief descriptions of the formulas used in the preparation of budget estimates for each of the major functional activities within the college:

3.1 FORMULAS FOR INSTRUCTIONAL COSTS

Each state begins the estimating process with a projection of full-time equivalent (FTE) student enrolment. The actual definition of FTE varies slightly from state to state but that is not too important.

On the basis of projected FTE enrolment, a calculation is made of the number of faculty members required:

- Kentucky uses a student - faculty ratio which is negotiated for each institution.

- Tennessee applies different ratios according to the size of each institution:

15-1 for the first 1000 students
30-1 for the next 2000 students
20-1 for enrolment in excess of 3000

- Texas applies different ratios for each program ranging from 10-1 in Fine Arts to 19-1 in Liberal Arts.

- Florida recalculates the required number of faculty members in terms of a ratio of student-credit-hours to FTE faculty which is renegotiated every two years for each individual institution.

- California has standard student-faculty ratios for each course. The ratio varies by subject matter, method of instruction (e.g. lecture, lab., or seminar) and enrolment by section.

- Oklahoma has determined the basic complement of academic faculty by reference to actual practice in smaller state-supported institutions. Additional faculty positions are allowed for enrolment above a certain minimum.

After each college has determined the total number of faculty members required, faculty salaries are calculated by multiplying the number of positions times the average salary in the various categories. No state has a set formula for the determination of staff salaries. Each state determines staff salaries through a negotiation process based on current salary levels in the state and the academic community concerned.

Estimates of other instructional costs such as supplies and equipment are handled differently in each state:

- California institutions each submit to the state a separate request for funds for institutional equipment and supplies.

- Oklahoma,Tennessee and Texas allow a percentage of academic salaries for instructional supplies and equipment. The actual percentages are based on past experience in each state and range from 15% to 33%.

- Kentucky negotiates an absolute amount with each institution.

- Florida calculates the amount separately for each institution on the basis of the cost per student credit hour for supplies and equipment (1964: $1.20)

3.2 FORMULAS FOR ADMINISTRATIVE COSTS

Administrative costs are calculated in several different ways:

- Florida, Oklahoma and Tennessee calculate administrative costs as a percentage of instructional costs ranging from 18% to 33%.

- Kentucky bases its calculations on a review of actual expenditures in past years adjusted for increases in workload and wages and prices.

- California has drawn up a master list of required administrative positions for various types of institutions. The cost is calculated on the basis of these fixed staffing patterns.

- Texas differentiates between institutions of varying size. The state allocates: (1961-63):
  - $2.20 per student credit hour for the first 120,000 credit hours (the approximate equivalent of 4000 enrolment);
  - $1.65 per student credit hour for the next 120,000 credit hours; and
  - $1.50 per student credit hour thereafter.

3.3 FORMULAS FOR LIBRARY COSTS

Five different methods are used by the states under study for the calculation of library costs:

- Two states determine library cost as a percentage of institutional costs: Oklahoma 8% and Tenessee 7.7%

- Kentucky awards $30.00 per student for libraries.

- Texas uses separate formulas to calculate (1) the number of library staff required, (2) the number of books required and (3) other operating costs.

  The number of staff is based on enrolment:
  one for every 300 FTE students for the first 1500;
  one for every 400 FTE students for the second 1500;
  one for every 500 FTE students thereafter.

The size of the collection is specified separately for each institution and varies according to the programs offered and enrolment.

A 6% of combined staff and book costs is added for other operating expenditures.

- Florida has made a commitment that each institution will be enabled to reach the standards set by the American Library Association.

- California applies a series of workload measures. The most important determinant is the amount of volumes allowed:
  4 volumes per student for the first 1000
  2 volumes per student for the next 4000
  1 volume per student thereafter.
  The total number of volumes is multiplied by an average cost per volume and then an additional 65% is added for processing and other library expense.

3.4 FORMULAS FOR PHYSICAL PLANT OPERATION AND MAINTENANCE

Three states calculate the cost of physical plant operation and maintenance as a percentage of institutional costs:

- Oklahoma: 27%
- Tennessee: 18.5%
- Florida: negotiated each year for each institution.

- Kentucky and Texas apply a cost per square foot for various types of space.

- California uses a complex formula to calculate the number of positions and costs based on various workload factors such as: number of students, square feet of building space, acres of campus grounds, etc.

3.5 MISCELLANEOUS FORMULAS

In addition to the formulas described above, some of the states use formulas to calculate the cost of a variety of other activities, for example: Florida, Oklahoma and Texas add a small percentage of instructional costs for research. Oklahoma adds 10% of instructional costs for extension and public service activities. California uses formulas to calculate the cost of audio-visual services, student health services and student personnel services.

3.6 SOME NOTABLE FEATURES

It may be useful to highlight some of the more important features of the formulas used by the various states:

(1) In contrast with the Ontario university formula financing scheme, separate formulas have been developed for each of the main functional activities of the colleges.

(2) In each formula, student enrolment is the primary determining factor of the budget estimates of the institution.

(3) Most states recognize the fact that small colleges have higher per student costs because they are not

able to take full advantage of economics of scale. Using different formulas for different size colleges compensates for small or growing institutions.

(4) Most states have established procedures for the periodic review of various formulas or unit costs.

4. ADVANTAGES AND DISADVANTAGES

Advantages claimed for formula financing schemes are: (2)

(1) Formula financing schemes assist in the analysis of resource needs and the presentation of budgetary information to funding agencies. It also assists in long term financial planning.

(2) Governments are provided with a means of foreseeing and controlling on a consistent basis, the general magnitude of college grants.

(3) There is a maximum incentive for the universities to be efficient and to arrange their affairs well; any notion that improvement in efficiency would lead to a corresponding reduction in support is offset.

(4) Formula financing usually has wide political

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(2) "Report of the Committee on University Affairs, 1967," Douglas T. Wright, Chairman, P. 12

acceptability. It protects governments from the charge of infringement on university autonomy. It facilitates the justification of increasing expenditures. The resulting grants are demonstrably equitable.

(5) Formula financing schemes allow individual institutions flexibility in course design and freedom in ordering their priorities.

(6) Private donors are assured that gifts for operating purposes are an added resource to the university and not a substitute for public support.

(7) Formula financing systems usually add a greater element of rationality to the budgetary process.

There are also criticisms:

(1) Formula financing is usually defended on the argument that it represents an equitable method of distributing financial aid. Exactly what equity is and why it is desirable is not clear. Furthermore, formula financing often tends to be arbitrary.

(2) Although formula financing systems are not intended to determine the pattern of spending within the university, pressures do develop within various parts of the university for funds to be distributed according to the "income generated by those parts."

(3) Formula financing often copes poorly with the development of new institutions and new programs.

(4) Formula financing provides no rationale for the allocation of public resources to universities as opposed to other areas of the public sector.

(5) Formula financing schemes have often built in false incentives. For example, the Ontario scheme encourages universities to maximize their income by increasing enrolment in specific categories.

(6) Formula financing schemes make it more difficult to effect basic changes in the system.

(7) Formula financing is useful only to determine the amount of government support. In many cases it is not useful in the internal budgetary process of each institution.

5. OBJECTIVES AND CRITERIA

The objectives of the formula financing scheme for Ontario Colleges of Applied Arts and Technology would be to meet the financial needs of the colleges to enable them to accomplish their basic objectives: (3)

(1) to provide courses of types and levels beyond, or not suited for, the secondary setting;

(2) to meet the educational needs of graduates from any secondary school program, apart from those wishing to attend university;

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(3) Ontario Department of Education, "Colleges of Applied Arts and Technology: Basic Documents", June 1967, P. 13.

(3) to meet the educational needs of adults and out-of-school youth whether or not they are graduates.

The formula financing scheme to be developed should have the following characteristics:

(1) it should be carefully defined and understood by all concerned.

(2) it should allow for differences among institutions not only in existing programs but also for differences in educational methods and administrative practices.

(3) the scheme should have built-in incentives for educational effectiveness and administrative efficiency.

(4) it should be sensitive to the most important cost variables of the colleges such as enrolment, subject areas, methods of instruction, size and location.

(5) it should be acceptable to the colleges and the Department of Education.

6. THE DEVELOPMENT OF A FORMULA

From the start, one fact must be clearly understood; the decision on the part of the government to fund educa-

tional programs at certain levels is basically a political decision. It is therefore dependent upon two factors:

1) the Government's assessment of the importance of the CAATS' contribution to the well-being of the Province; and

2) their assessment of the financial requirements of the CAATS to make that contribution.

It is therefore, in the interest of the CAATS to demonstrate clearly to the Government of Ontario that

1) the educational services provided by the CAATS are essential for the well-being of a significant segment of the people of Ontario and for the economy as a whole; and

2) that the funding levels requested for various educational programs are necessary to maintain proper academic standards.

The first point is not of immediate concern here but will be discussed briefly, later in this paper.

The second point is of prime importance in the development of a formula financing scheme. So far, the colleges have not effectively demonstrated that particular funding levels are required for certain programs in order to maintain proper academic standards.

Current attempts at developing a formula financing scheme for the CAATS have been aimed at calculating per student program costs in each college with the hope of

discerning consistent cost patterns to form a basis for a formula. The attempts have not been very successful because no consistent cost patterns could be discerned. This is due to the great divergence in the colleges of program offerings, teaching methods, administrative policies, etc.

One obvious way to overcome the current difficulty in developing a formula is to standardize programs, teaching methods and administrative policies for all of the colleges. In such a situation per student program costs would be very similar in each college varying only by enrolment and, perhaps, size and location of the college. However, this alternative is clearly undesirable from many points of view.

A more positive alternative is to continue to allow colleges complete freedom in course design, teaching methods, etc., but specify some reasonable funding levels for each major program. The question to be answered for each major program (for a possible list of major programs see Table I) is: what is a reasonable level of per student program cost?

6.1 CONCEPTUAL APPROACH

Traditionally, per student program costs are arrived at through a detailed financial analysis of the budget or financial statement of the particular college. In the next few pages, an analytical process will be described which will focus primary attention on such variables as teaching methods, administrative policies and institutional charateristics. The basic purpose of the analysis is to develop objective information regarding the cost of a range of reasonable program alternatives in different institutions. The information will serve as a basis for the negotiation of

TABLE I

POSSIBLE LIST OF MAJOR PROGRAMS

1. Technology
2. Technician
3. Mechanical
4. Apprenticeship
5. General Arts & Sciences
6. Communication Arts
7. Administrative Sciences
8. Secretarial Sciences
9. Marketing & Services
10. Library

specific funding levels for each major program between the CAATS and the Government.

There are four basic analytical tasks which need to be performed:

1. The first analytical task is to determine precisely the reasons for the significant variations in current per student program costs in each of the colleges. This analysis would result in the identification of the important cost variables in each major program. The variables would be divided into two groups: controllable variables (e.g. teaching method) and uncontrollable variables (e.g. size and location of the institution). (For a possible list of variables see Table II.)

2. The second task would be to test the sensitivity of each of the controllable and uncontrollable variables. This may be accomplished most effectively through the use of a simulation model. With a simulation model, it is possible to calculate the effect of a change in one variable while all others are held constant. The type of hypothesis to be tested would be, for example:

   (a) the size of total enrolment at the colleges significantly influences program costs;

   (b) the particular combination of programs offered at a college affects program costs;

   (c) year round operations in a tri-mester system reduces program costs;

   (d) special grants are required to initiate new programs.

TABLE II

ILLUSTRATIVE LIST OF VARIABLES

1. Variables Which May Be Controlled By the College

1.1 Teaching Method
- Lecture
- Laboratory
- Seminar
- Computer Assisted Instruction (C.A.I.)
- Educational Television (E.T.V.)

1.2 Administrative Policies
- Staff Teaching Load
- Space Utilization

1.3 Program Characteristics
- Years of Duration
- Sessions Per Week
- Hours Per Session

2. Variables Which May Be Controlled Only With Considerable Difficulty

2.1 Program Configuration
- i.e. the combination of major programs to be offered at each institution

2.2 Program Enrolment

3. Variables Which Cannot Be Controlled By the College

3.1 Geographic Location of College

3.2 Certain Unit Costs
- construction costs

The result of the simulation analysis would be to identify those factors which significantly effect program costs.

(3) The third analytical task consists of the exploration and identification of the full range of reasonable alternative combinations of controllable variables which might be utilized to conduct each of the major programs.

(4) The fourth task would be to calculate the cost of each set of alternatives and to test the sensitivity of the resulting per student program cost against the various uncontrollable variables of several institutions. Once again, this type of calculation may best be performed with the aid of a simulation model.

The analysis would produce two specific outputs:

(1) an extensive list of reasonable alternatives for the conduct of each major program; and

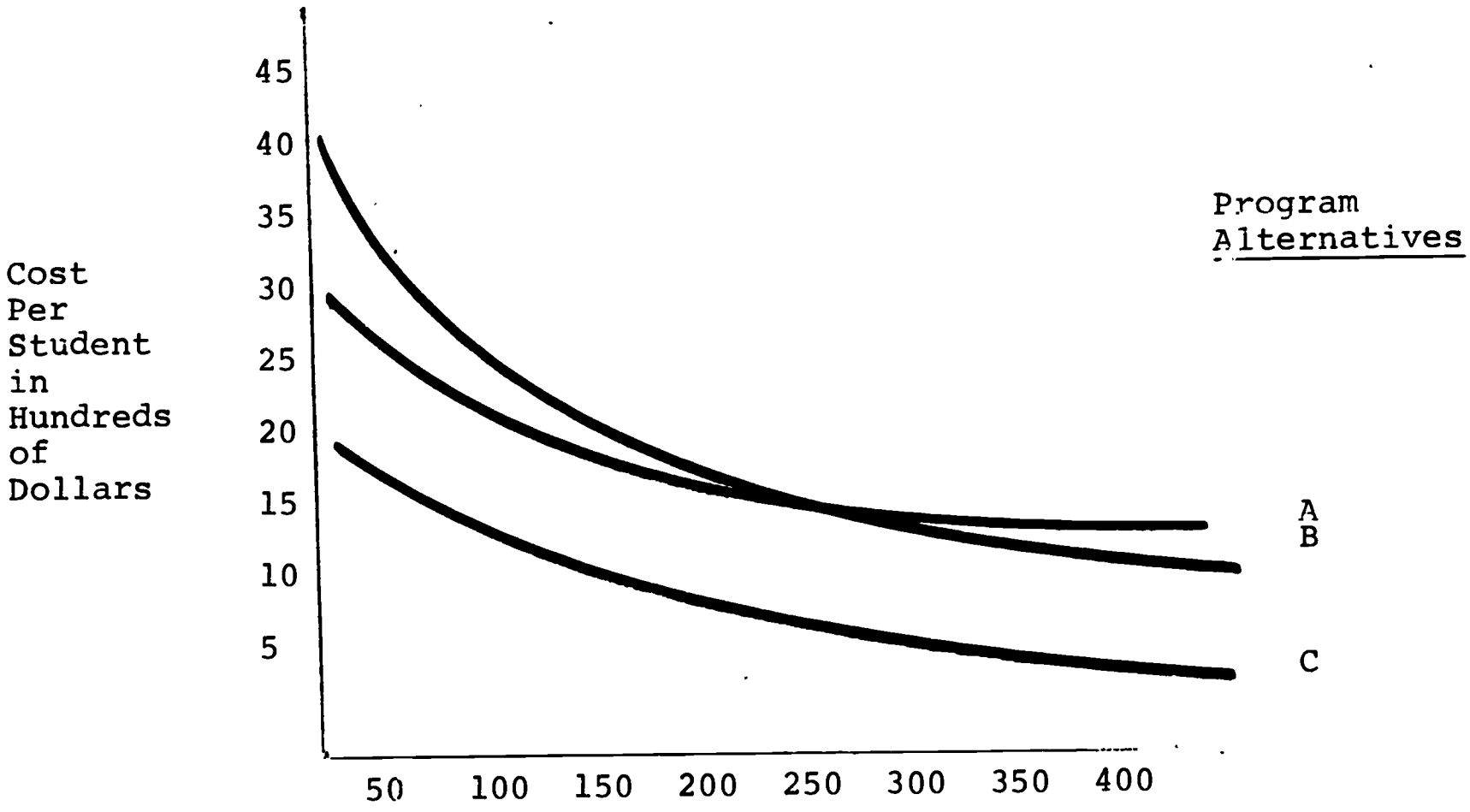
(2) the per student cost of each alternative to different colleges. (See Figure 1)

The extensive program cost information would serve as an excellent base for the negotiation of acceptable funding levels for each major program. For each dollar amount proposed the analysis would indicate which alternatives could be adopted by each college. Thus the negotiations could centre on the most important issue: which set of alternatives will enable the colleges to accomplish their basic objectives.

FIGURE 1

PER STUDENT COST OF PROGRAM ALTERNATIVES

(ILLUSTRATIVE ONLY)



The process just described may serve to develop a formula for operating grants. However, the same basic process could also serve to develop a formula for capital grants. Indeed, the cost of physical facilities may be included as one of the many variables to be considered so that a combined operating and capital formula could be developed.

One point needs to be made quite explicit. No formula financing scheme is intended to determine the internal resource allocation process of individual colleges. It must be clearly understood that the formula to be developed would only be intended to determine the amount of financial support each college is to receive from the Government. In fact, the analysis as outlined above would provide each college with a complete range of alternatives it may want to adopt.

6.2 PROJECT OUTLINE

Using the conceptual approach described above, a formula could be developed in about four to six months. Thus if a project were initiated within the next month or two, it could be completed early in the summer of 1970, thereby allowing sufficient time for the colleges and the Government to adjust to the use of the formula for the 1971-72 fiscal year.

The project would have a number of identifiable stages:

(1) The first requirement is the establishment of a study team and the choice of several representative colleges for detailed study.

Since simulation models have already been developed for three of the CAATS, it would be logical if these were chosen for the first part of the study.

(2) The first part of the study would consist of a detailed analysis to determine precisely the definition of major programs, the list of variables which are significant and the sensitivity of each of the significant variables. This analysis could be accomplished in about two months if the campus model and the information collected at the three colleges would be used for the analysis.

(3) The third stage in the project would consist of the identification of the various alternative program designs employed not only by the three colleges chosen for the detailed study, but for all the Ontario colleges. As a result, the project team could produce a complete inventory of current program designs. In addition, the project team could explore alternatives such as C.A.I. or E.T.V. which are not yet widely used in all programs. The project team might decide at this point to limit further analysis to a limited number of alternatives for each major program.

(4) The list of program alternatives would then be simulated for small, medium and large colleges, given various administrative policies and different levels of enrolment. A list of alternatives and per student program costs for each alternative would then be produced.

(5) On the basis of the objective information concerning various program designs and their related

costs the Presidents of the CAATS could then negotiate with the Department of Education and, perhaps, the Treasury Board the funding level to be adopted for each major program i.e. the formula.

(6) The entire process could be reiterated periodically, for example, every two or three years, to ensure that the funding levels for each major program remain adequate to maintain adequate educational standards. In between review periods, the funding levels for each program would have to be adjusted annually to compensate for increases in wages and prices.

Figure 2 illustrates one possible form which the final formula might take.

7. PLANNING, BUDGETING AND FORMULA FINANCING

The introduction of a formula financing scheme will of course require certain changes in the planning and budgeting process of the CAATS. Following is a brief outline of a planning and budgeting cycle.

FALL

(1) The most important step in the planning and budgeting process is the determination of the objectives of the institution. In the CAATS this requires the systematic analysis of the DEMAND for education in the field of applied arts and technology to meet the objectives and needs of STUDENTS and SOCIETY at large.

FIGURE 2

POSSIBLE FORM OF THE FORMULA

NOTE: The amounts shown are hypothetical per student grants.

PROGRAM	PROGRAM ENROLMENT			
	0 - 50	50 - 75	75 - 150	150+
TECHNOLOGY	$4500	4400	4200	4000
GENERAL ARTS	$2800	2500	2500	2300
COMMUNICATION ARTS	$3500	3400	3300	3300
	COLLEGE ENROLMENT			
	0 - 500	500 - 1000	1000 - 2000	2000+
LIBRARY	$120	105	90	75

The first step therefore is to prepare accurate enrolment predictions and to evaluate current employment patterns in the community and the province. In light of the above analysis the college would then establish new objectives or adjust current objectives.

(2) The second step consists of the development of various alternative programs that would accomplish the objectives of the College. The impact on resource requirements of each alternative must then be calculated. This may be done most effectively with the aid of a simulation model.

WINTER

(3) The third step consists of the preparation and submission of a long-range forecast of the colleges' workload and resource requirements to the Department of Education.

The submission of the long range forecast would serve two basic purposes. First, it would include an accurate statement of the current college enrolment. This would serve as a basis for the final calculations of the formula income each college is entitled to for the current year. Secondly, the forecasts would allow

SPRING the Department of Education to prepare its forecast of total departmental operations which is required by the Treasury Board for April 1 of each year.

SUMMER

(4) As stated on page 2, the cabinet undertakes its basic policy review during each summer. Subsequent to the review, the Cabinet issues certain policy

directions and budgetary guidelines. This allows the individual departments to prepare their budgetary estimates with some understanding of the size of increases that will be allowed. In the same manner, the Department of Education might be able to give the CAATS an indication of the general increase in funding levels (e.g. 3%, 6% or 8%) that could be expected for the next fiscal year.

FALL

(5) Early in the fall the CAATS would submit to the Department of Education a preliminary statement of enrolment of expected formula income. This would enable the Department to prepare its final budgetary estimates required by the Treasury Board in October.

(6) In light of the general budgetary guidelines, the Colleges are then able, once again, to review their objectives, test alternatives with the aid of a simulation model, and revise the long-term forecast.

Admittedly, it will not be easy for the colleges to prepare accurate long-term forecasts at first. But after several iterations, the forecast should become both easier and more accurate.

8. CONCLUSION

In this paper, an attempt has been made to explore various formula financing systems,to consider their ad-

vantages and disadvantages and to suggest a new approach.

Underlying the entire discussion has been the realization that, ultimately, the decision to allocate a certain amount of public funds to the CAATS is a political decision. The type of analysis outlined in Section 6.1 would provide not only a formula for the allocation of funds to each individual college but also a rationale for the determination of the total amount to be allocated by the government to the Colleges of Applied Arts and Technology.