

EDUCATIONAL PLANNING



Journal of the International Society of Educational Planners

Volume 3 No. 1

May, 1976

EDUCATIONAL PLANNING

Journal of the International Society of Educational Planners

Volume 3, No. 1 May 1976

Editor

Cicely Watson, The Ontario Institute for Studies in Education

The journal prints articles on the theory and practice of educational planning, case histories, and articles from related specialties (economics of education, sociology of education, demography, town planning, institutional research, operations research, educational research, and applied mathematics) which are of interest to educational planners.

The journal also regularly includes reviews of publications in this field and related fields.

Articles or publications for review should be submitted to the Editor, c/o the address below. All articles will be assessed by three readers chosen by the Editor from a group of consultants. The publication decision of the Editor shall be final. Three copies of manuscripts should be submitted, together with return postage, if the author wishes their return.

MSS must be typed, double spaced on one side of the paper with wide margins (at least 1½"). Graphs, etc., should be in ready photocopy format. References should be listed at the end of the article.

Subscription rate: \$20.00 per year or per volume, U.S. or Can. (Subscriptions may run for the calendar year or by volume, May to April.) Single back issues: \$5.00.

Information on advertising is available on request from:

Dr. Cicely Watson
Department of Educational Planning
OISE
252 Bloor St. West
Toronto, Ontario M5S 1V6
Canada

EDUCATIONAL PLANNING

Journal of the International Society of Educational Planners

Volume 3 No. 1 May, 1976

CONTENTS

FORECASTING THE MOVEMENT OF EDUCATIONAL ADMINISTRATORS THROUGH VACANCY FLOWS Daniel J. Brown	1
BACKCASTING FROM GRADUATION TARGETS TO REQUIRED ENROLLMENTS USING THE GENERALIZED INVERSE OF THE TRANSFORMATION MATRIX Lawrence Bezeau	11
FORECASTING NOTES—II Cicely Watson	22
ECONOMIES OF SCALE IN THE OPERATION OF PUBLIC ELEMENTARY SCHOOLS Gary P. Johnson and Robert L. Mitten	38
EDUCATIONAL PLANNING FROM TAXONOMIC TO TRANSFORMATIVE E. Dan Inbar	46
MANAGING POLICY DEVELOPMENT IN PUBLIC SERVICE ORGANIZATIONS Stephen S. Kaagan and Janice J. Weinman	58
THE IMPACT OF CANADIAN FEDERAL FINANCIAL ARRANGEMENTS ON PROVINCIAL EDUCATIONAL SYSTEMS Wilfred J. Brown	69
THE A-95 REVIEW: ITS ROLE IN EDUCATION PLANNING Kenneth J. Dyl and Bruce Morton	83
REVIEWS	89

FORECASTING THE MOVEMENT OF EDUCATIONAL ADMINISTRATORS THROUGH VACANCY FLOWS

The purpose of this paper is to present a case for a recently discovered model which is suitable for the study of administrator movement and use in administrative personnel planning. The model is appropriate for forecasting manpower flows in administrative hierarchies of educational organizations. In this paper the problem is first discussed, and groups of manpower models are then reviewed. After that the characteristics of administrative hierarchies are discussed and the vacancy model presented in light of the characteristics. Then following the description of an example, validation and projective tests are carried out to evaluate the model. In the conclusion, some possibilities for further research and the limitations of the model are mentioned.

The Problem of Forecasting Personnel Movement

Gibson and Hunt define the personnel function as the allocation of persons to positions.¹ The allocation may be broken down into three stages which reflect the input, process, and output view of organizations. These are hiring, employing, and withdrawal. In their opinion, during these three stages there are two basically different points of view which must be kept in mind.

One is that of the institution and its concern for organizational productivity, maintenance, etc. Examples of such concerns are those pertaining to resource allocation, such as the number and seniority of persons at various job levels which determine the total salary load on the budget. For example, if it has been determined that the budget must be reduced by eliminating a number of positions, then, once the positions have been identified, a knowledge of future personnel movement would aid in planning the reshuffling process. The kind of persons in the various levels of positions would also affect the process because legal questions may arise concerning the representation of groups of different sex and ethnicity. Anticipation of movement is one of the first steps in planning for equitable distribution of different groups. A third problem which should be foreseen is the amount of organizational disruption which could result from role changes wherein persons establish new relationships, master new procedures, and usually are less productive during their initial time in a position. The second perspective is that of the individual, his perception of the day-to-day reward structure in the short term, and his career in the long term. *Who* will get promoted is, of course, the intriguing question.

Given these concerns, it would be helpful to educational administrators to be able to understand the process of personnel movement better and predict it more accurately.

*Assistant Professor, State University of New York at Buffalo. The author wishes to thank C. Arnold Anderson, Marnie D. Brown, R. Oliver Gibson, Marilou Healey, David D. McFarland, and K. George Pedersen for their valuable guidance and criticisms, and the Canada Council and the State University of New York for their support.

Models for Manpower Forecasting at the Institutional Level

In a recent article, Liliem and Rao attempted a rough classification of manpower models.² Of the three groups considered, one was based upon a birth and death approach where personnel are seen as moving through various strata of the organization according to a probability matrix. An example of this kind of thinking is given by Vroom and MacCrimmon who use a Markov chain as a subjective device.³ A management-oriented discussion of this approach is given in Dill *et al.*⁴ Unfortunately, this point of view does not take into account the fact that the fine structure of an organization, its network of jobs, is imposed upon the personnel within. On the contrary, the basic assumption is that persons are free to move within the strata. It would seem, then, that such an approach is not appropriate to the study of the movement of personnel in administrative structures. The second group included the optimization models which are also based upon the method of probability matrices just mentioned. An example of this type of model is given by Grinold and Stanford.⁵ They assume that persons provide the impetus for the process and that the only structure is that of rank. While this assumption appears valid for their example (university professors and faculty promotions) it is inappropriate for the administrative structures of school systems. The third category, the behavioural approach, tends to have two difficulties, one inherent and the other imposed. The inherent difficulty is the use of qualitative inputs which invariably result in qualitative outputs, i.e., the outcomes are never particularly secure compared to those generated by relatively hard data. The second problem with the behavioural approach is that it tends to be individually oriented so it also assumes that persons *generate* mobility rather than that it arises from the structure. Bryant, Maggard, and Taylor classify manpower planning tools as: statistics, operations research, networks, and simulation.⁶ Greenlaw's classification goes considerably beyond the task of manpower forecasting,⁷ and Balinsky and Reisman offer the most general taxonomy of manpower models for educational planning.⁸ Unfortunately, except for network models which are defined in terms of individual jobs rather than categories of positions, the same criticisms apply to most of the models considered.

The obvious conclusion that some of the models' basic assumptions are faulty may in fact partly explain their lack of implementation in educational institutions. According to the Watson survey, only one percent of institutions are using manpower forecasting models, and in this case, it is a single university using a faculty flow model.⁹

Characteristics of Administrative Hierarchies in Education

In order to better understand the process of personnel movement within educational organizations, perhaps such organizations should be examined from a different point of view, that of networks. The following attributes are apparent: (1) the organizations are definitely open systems of personnel flow but they generally promote from within, particularly in conditions of recession or enrollment decline; (2) since, by and large, there is a one-to-one correspondence between persons and jobs, persons wearing two hats are relatively infrequent; (3) administrative roles (networks of positions which make up the organizations) are fairly long lived, they often persist for decades; (4) criteria for promotion and associated procedures are relatively stable; (5) although educational organizations range in size from very small school districts to large urban ones,* many have administrative structures including at least a hundred jobs, and they

*And include institutions (like universities) of greatly varied sizes.

keep records of the moves of personnel or changes of roles and their incumbents. This list describes the kind of organization to which a vacancy model is ideally suited.

The Vacancy Model

Once the existence of the network of jobs is recognized, and providing the remaining assumptions about organizational structure are accepted, what is needed is a further set of assumptions about the mobility process. This is contributed by the concept of "vacancy" advanced by White.¹⁰ This notion conveys the idea of a void. Vacancies are created when a job is created or a person leaves the hierarchy. Vacancies may be destroyed when a position is destroyed or when an individual enters the hierarchy. But vacancies not only are born or die; they remain alive by passing from job to job until their (eventual) death. In this way, while vacancies move from job to job for the length of what might be called a "chain", people pass from job to job in single moves in the opposite direction over the same time interval. For example: If a superintendent retires, a vacancy is created in that position. If a principal is promoted to that superintendency, the vacancy may move to a secondary school principalship and then move on to an elementary school principalship if that incumbent is promoted. The vacancy may move outside the system if a "recruit" is brought into the administrative hierarchy to fill the job of the elementary principal. The vacancy leaves as the recruit enters, having lived for a chain of three moves. Each move of those people was *preceded necessarily* by the appearance of a vacancy, and coincided by the movement of the vacancy to his or her present position. There is a sequence of cause-and-effect which began with the generation of the initial vacancy and ended with the termination of the final vacancy.

This view of the structure of the educational organization and its upward mobility process may be formulated as follows: When a vacancy is born, there are only two probabilities to be associated with its movement. Either it will continue in the system moving to another job with probability q, or it will move outside the system with probability p. Should a vacancy leave on the first move, the probability associated with such a chain of one link would be p. Should the vacancy first move inside and then out, assuming the two movements are independent, it would have probabilities q and then p, or together as a chain of two links it would have a probability of qp. Similarly, for a chain of j links, the associated probability is¹⁰

$$P_j = q^{j-1}p. \tag{1}$$

The value of equation 1 to the educational planner is a partial validity check on the vacancy model for his or her particular organization. If the distribution of chain length is governed by the above equation, then it may be said that the vacancy model is appropriate to that organization. Past observation provides the data for such a test.

The average or expected length of a vacancy chain may be shown to be 1/p. That is to say, if one vacancy appears and it is known that the probability of exit on any given move is equal to .25, it is expected that the chain will live a sequence of four moves. In terms of people, that means that four moves will be observed, four people will be promoted that particular year interval. Providing that it is possible to determine in advance the total number of initial vacancies occurring in the system, then it would be possible to determine the total number of moves on the part of all personnel which are likely to be observed during the following year. Thus, the expected number of moves is

$$\hat{m}(t + 1) = \hat{f}(t+1)/p(t) \tag{2}$$

where $\hat{f}(t+1)$ is interpreted as the total number of people leaving plus the total number of job entrances during the coming year and where $p(t)$ is simply the probability that a vacancy will leave, estimated from data from the present year. The above equation thus relates the appearance of vacancies to their resulting movement. However, equation 2 simply produces an expected number of moves. It does not give any indication as to the possible variation about that number. Unlike many models which are conceived stochastically and applied deterministically, vacancy models permit a stochastic output. Instead of simply multiplying the number of expected initial vacancies (f) by the average length of the chains, it is possible to multiply that number by the probability of each of the chain lengths to give the number of moves associated with chains of each length. This may be expressed as

$$\hat{m}_j(t+1) = \hat{f}(t+1)q^{j-1}(t)p(t) \quad (3)$$

The amount of variation in the forecast error which can be expected may be estimated from the variance about the mean number of moves forecast. This is

$$\hat{v}(m, t+1) = q(t)/p^2(t) \quad (4)$$

The square root of the quantity in equation 4 gives an estimate of the extent of the average error which could be encountered.

Model Example

The administrative hierarchies of three large urban school systems, (Chicago, Detroit, and Philadelphia) were chosen for study because they appear to fit the assumptions of the vacancy model well and are typical of educational institutions that have hierarchies of ample size. Data were collected in terms of a matrix of a sequence of years upon one dimension and a listing of jobs on the other. The entries were marked by the names of persons holding the jobs at that particular time. Newly-created jobs, exits of persons, jobs removed, and persons entering the system were noted. The movement of persons from job to job within the hierarchy and the vacancies thereby created were also recorded. Twenty years' data were collected, along with job titles (up to 700 in each system). It would not be necessary to collect thousands of pieces of information to apply the model to any one school or university, but for the initial test it was felt that a large data base was advisable.

A preliminary *qualitative validation* of the vacancy model may be carried out by comparing its assumptions with the actual hierarchical structure and promotion processes of the system. In addition, the model may be validated *quantitatively* in a preliminary way by checking the results of equation 1 against the distribution observed. The primary function of this test is for independence of vacancy moves. If the promotional process is decentralized so that decisions are made independently of one another, then the results of the model should conform closely to the movements observed. However, if the mobility process is carried out by a central authority, then vacancies will not have the same probability of leaving on each move and the two distributions will differ. For this test data were selected from the fifth, tenth, fifteenth, and twentieth years so that a cross-section on all promotion policies could be assessed: The only alteration made in the raw data was the elimination of cases involving only a change in the name of a job (which usually applied to a change in school name so movement was seen as being apparent rather than real).

EDUCATIONAL PLANNING

TABLE 1 VACANCY CHAIN LENGTH DISTRIBUTIONS FROM MODEL AND OBSERVATIONS, TOTAL SAMPLE AND THREE SCHOOL DISTRICTS

Chain Length	Total Sample		Chicago		Detroit		Philadelphia	
	Model	Obs.	Model	Obs.	Model	Obs.	Model	Obs.
1	.56344	.56344	.50746	.50746	.63265	.63265	.5726	.5726
2	.24579	.28602	.24994	.31343	.23240	.27210	.2447	.2564
3	.10738	.09247	.12310	.11442	.08537	.06122	.1045	.0940
4	.04687	.03870	.06063	.03980	.03136	.02721	.0447	.0512
5	.02046	.01720	.02986	.02487	.01152	.00000	.0191	.0256
6	.00893	.00215	.01470	.00000	.00423	.00680	.0081	.0000
7	.00390	.00000	.00724	.00000	.00155	.00000	.0034	.0000
Number	465		201		147		117	

TABLE 2 MODEL'S AND OBSERVED MEAN VACANCY CHAIN LENGTHS, TOTAL SAMPLE AND THE THREE SCHOOL DISTRICTS

	Model's Mean Length	Observed Mean Length
Total Sample	1.775	1.682
Chicago	1.971	1.781
Detroit	1.581	1.526
Philadelphia	1.746	1.700

Table 1 portrays the model's and the observed distributions. The model's results were generated by equation 1 assuming that the observed number of vacancy chains of length one is correct. Since the differences are relatively small and tend to vary with no particular pattern, it was concluded that the vacancies in each of these school hierarchies follow tracks which are apparently random, independent of previous moves. The observed distributions do not differ from one another in any special way, except that the probability of leaving on the first move is smaller for Chicago and larger for the others. This probably is a reflection of system size. Another way of expressing the same concept is shown in Table 2, where the average length of chains is compared. Chicago has the longest, but the difference between Detroit and Philadelphia, systems of comparable size, can only be accounted for by differences in their promotional policies. That is, Philadelphia's longer average length indicates a greater propensity to promote from within the hierarchy.

Prediction of Vacancy Movement

Once the initial assumptions of the vacancy model are shown to fit the organization, and a validity check carried out and found to be within acceptable error tolerance, then an attempt to predict vacancy movement for the coming year may be made with some assurance of success. For the prediction, we return to equation 2:

$$\hat{m}(t+1) = \hat{f}(t+1)/p(t), \quad (2)$$

where $\hat{m}(t+1)$ is the number of moves predicted, $\hat{f}(t+1)$ is the estimated number of jobs created and men leaving, and $p(t)$ is the observed probability of vacancy leaving on the next move, found from

$$p(t) = f(t)/m(t) \quad (5)$$

which are known quantities.

The value of $f(t+1)$ is a little less certain, however. It will not do to estimate $f(t+1)$ by $f(t)$, since the number of initial vacancies varies considerably. Yet for a school district, the number of new jobs is a function of factors such as the income of the district, the rate of growth exhibited by the district, the demand for new services by the community, and the number of new school buildings scheduled to be completed during the interval. The number of persons who will be leaving the hierarchy may be forecast on the basis of known retirements, death rates, occurrence of illness, or simply the annual turnover. While the best test of the model would have this kind of estimation of $f(t+1)$ built in, such information was not available retrospectively, so the actual, known value of $f(t+1)$ was substituted for $\hat{f}(t+1)$.

The payoff of a year-by-year projection is shown in table 3. The projections appear to conform reasonably well to observed results and the extent of least squares error is measured by the root mean square error (RMSE), which may be interpreted as a "typical" error. For administrative purposes, when differences above or below the ideal are viewed as being equally misleading, it may be more reasonable to consider the mean absolute error (MAE); or when systems are to be compared, the average absolute percentage error (MAPE). Whatever the criterion, it must be below the level of tolerance for any particular application, and the final judgement must be that of the educational planner. These mean errors are found to be fairly consistent, as shown by table 3. Over all, the projections appear to be sufficiently accurate to show that the model is valid and can be of use to planners.

EDUCATIONAL PLANNING

TABLE 3 PREDICTED VACANCY MOVEMENT AND OBSERVED MOVEMENT,
FOR THREE SCHOOL DISTRICTS, 1951-1970

Year	Chicago			Detroit			Philadelphia		
	Pred.	Obs.	Err.	Pred.	Obs.	Err.	Pred.	Obs.	Err.
1951-52	48.0	53	-5.0	28.0	23	5.0	36.0	36	0.0
1952-53	76.2	68	8.2	37.8	43	-5.2	30.9	23	7.9
1953-54	59.2	87	-27.8	37.3	43	-5.7	65.2	88	-22.8
1954-55	144.0	137	7.0	62.3	55	7.3	36.2	36	0.2
1955-56	93.4	77	16.4	60.7	62	-1.3	24.0	29	-5.0
1956-57	70.2	64	6.2	67.8	59	8.8	33.1	29	4.1
1957-58	67.0	93	-26.0	57.3	58	-0.7	27.2	36	-8.8
1958-59	102.0	91	11.0	83.6	68	15.6	55.2	42	13.2
1959-60	89.0	76	13.0	23.6	24	-0.4	21.9	31	-9.1
1960-61	81.0	85	-4.0	39.5	42	-2.5	23.2	17	6.2
1961-62	97.1	112	-14.9	42.0	43	-1.0	41.6	41	0.6
1962-63	122.0	116	6.0	66.0	75	-9.0	57.8	50	7.8
1963-64	107.0	108	-1.0	76.7	71	5.7	30.6	33	-2.4
1964-65	104.0	104	0.0	54.8	53	1.8	55.6	61	-5.4
1965-66	102.0	102	0.0	63.9	59	4.9	44.4	50	-5.6
1966-67	123.0	131	-8.0	96.4	99	-2.6	85.4	65	20.4
1967-68	129.0	121	8.0	78.3	80	-1.7	41.2	49	-7.8
1968-69	127.0	95	32.0	87.5	83	4.5	75.4	65	10.4
1969-70	80.5	77	3.5	103.0	104	-1.0	84.5	76	8.6
RMSE ¹			8.5			3.9			6.5
MAE ²			10.4			4.4			7.7
MAPE ³			11.7			8.1			17.5

¹Root Mean Square Error

²Mean Absolute Error

³Mean Absolute Percentage Error

While the occasional prediction is perfect (as in the case of Chicago 1963-64 and 1964-65), some show a large error (Chicago 1953-54, Detroit 1958-59, and Philadelphia 1953-54). Such disparities are often reflective of major administrative shakeups where the normal vacancy exiting probability, $p(t)$, is not applicable because of new policies affecting promotion. Where such a development is known in advance, the planner with intimate knowledge of the organization can adjust the normal predictive procedure to provide a more informed forecast.

A slightly different quantitative method of prediction could have been used. Rather than simply use $p(t)$ in equation 2, the future probability of leaving could have been estimated by the use of some kind of averaging technique, such as weighted moving averages or exponential smoothing. In this fashion, random movements in $p(t)$ would not affect the next year's prediction as much. However, a gain in stability is also a loss in responsiveness, and the present highly responsive model was chosen because the promotional policies of the current year are likely to be the best guide as to the policies of the next year. Another argument in favour of the present method is its parsimony. If implementation potential and model complexity are inversely related, then the simpler procedures are preferable.

Conclusion

Extensions of Vacancy Chain Concepts

One of the most logical extensions of the framework as described here would be acknowledgement of the various organizational levels within a hierarchy. White was able to do this with church organizations¹⁰ and the author (in an unpublished monograph) with school systems.¹¹ Vacancy movement, and hence the personnel movement, within various strata may be quite different. Vacancies may tend to start at the top of the organization and work downward. Or, to put it another way, their exit probabilities may vary across strata such that recruits are more likely to be brought into the system at the lower than the higher levels. However there are two major difficulties associated with this kind of thinking. One is that the process of stratification is somewhat arbitrary and can be made on the basis of different criteria—for example, salary, organizational divisions, or job title. Since jobs are enduring, job titles are also. But, even if stratification is described on that basis, a second problem arises which stems from the fact that educational organizations invariably have a pyramid shape, so the number of observations in the higher ranks are far fewer than those in the lower ranks simply by virtue of the location of fewer persons and jobs in these ranks. Unless the organization is extremely large this leads to estimation problems of probabilities in the cells of vacancy transition matrices. It is for this reason that this paper was constrained to a non-stratified view of educational organizations.

Another extension of vacancy chain models might be in the direction of further specification of the exact tracks vacancies will follow. It would be nice to know not only the number of expected moves in the organization in the coming period, but also who will likely move. One method of attacking this question is to study existing promotional lists. Of course, lists of pools of candidates are used with varying degrees of flexibility. In extreme cases it may be seen that vacancies follow exactly the track corresponding to the person in the number one position on each list for the job at which the vacancy has arisen. The concept of tracking leads naturally to the second question: Where have vacancies moved in the past? If such observations can be made and compiled,

there emerges a structure of vacancy moves and, along with it, the possible paths along which vacancies frequently travel. While such a consolidation may be difficult because of the disappearance of certain jobs during the interval studied, there is no question that such information is most revealing and holds interest for researchers and administrators alike. A third direction which the study of vacancy tracks may take is that of illustrating vacancy preferences. Vacancies move to positions occupied by persons preferred in view of the candidates' characteristics in their present position. The desirability of the applicant for a particular vacant position may be brought into account by considering standard variables such as sex, ethnicity, and a variety of administrative skills.

Limitations of the Model

The limitations of vacancy models are quite evident and should be noted. They are applicable strictly to administrative hierarchies and not to organizations with frequent job creations and destructions. Clearly, they do not establish a causal mechanism of determining whether a vacancy will flow from one specific job to another. Moreover, prediction error depends largely upon the accuracy of knowledge about future job creations and persons leaving. So historical data must be available to estimate parameters. Detailed records for at least two or three years are required. If the quantitative and formalized version of the model is to be of use, hierarchies with about a hundred or more positions are advisable.

The major contribution of a vacancy model to educational planning is two-fold. First, it sheds light on the structural mechanism of the promotion process by which people move upward (and very occasionally downward) in educational hierarchies. It therefore provides a basis for further research which has a far superior grounding than many earlier conceptual frameworks. Second, it gives personnel planners a tool to predict the volume of personnel movement for the coming year with reasonable accuracy. Because of the model's relative simplicity and its ability to generate predictions, it is one which appears to have a good chance of implementation.

REFERENCES

1. R. Oliver Gibson and Harold C. Hunt, *The School Personnel Administrator*. Boston: Houghton Mifflin, 1965, pp. 406-407.
2. Barry L. Lilien and Ambar G. Rao, "Model for Manpower Management", *Management Science*, Vol. 21, No. 12, August 1975, pp. B1447-1457.
3. V. Vroom, and K. MacCrimmon, "Towards a Stochastic Model of Managerial Careers", *Administrative Science Quarterly*, Vol. 13, No. 1, June, 1968, pp. 26-46.
4. W.R. Dill, D.P. Gaver, and W.L. Weber, "Models and Modelling for Manpower Planning", *Management Science*, Vol. 13, No. 4, December 1966, Series B.
5. Richard C. Grinold and Robert E. Stanford, "Optimal Control of a Graded Manpower System", *Management Science*, Vol. 20, No. 8, April 1974, pp. B1201-1216.
6. Don R. Bryant, Michael J. Maggard, and Robert P. Taylor, "Manpower Planning Models and Techniques: A Descriptive Survey", *Business Horizons*, April 1973, pp. 69-78.
7. Paul S. Greenlaw, "Management Science and Personnel Management", *Personnel Journal*, November, 1973, pp. 946-954.
8. Warren Balinsky and Arnold Reisman, "A Taxonomy of Manpower-Educational Planning Models", *Socio-Economic Planning Sciences*, Vol. 7, No. 1, February 1973, pp. 13-17.
9. Cicely Watson, "Canadian Experience in the Application of Quantitative Models for Educational Decision-Making", *Educational Planning*, Vol. 1, No. 1, May 1974, pp. 10-19.

Daniel J. Brown

10. Harrison C. White, *Chains of Opportunity*. Cambridge, Mass.: Harvard University Press, 1970.
11. Daniel J. Brown, "Men Against Chance: Vacancy Models of Mobility within Administrative Hierarchies of Public School Systems". unpublished monograph, State University of New York at Buffalo.

BACKCASTING FROM GRADUATION TARGETS TO REQUIRED ENROLLMENTS USING THE GENERALIZED INVERSE OF THE TRANSFORMATION MATRIX

This paper derives and examines a general solution to the problem of calculating school enrollments at time (t-1) necessary to meet predetermined graduation or manpower targets, based on the generalized inverse of the transformation matrix which describes pupil flow through the school. The author has applied this technique at a time when there was no theoretical basis for it.¹ This paper provides such a basis.

The field of generalized inverses contains a confusion of definitions and names. The one used here is the strong or unique generalized inverse defined by four equations given below. For many but not all of the findings in this paper a weaker non-unique inverse meeting fewer than 4 of the conditions would have sufficed. To achieve simplicity of presentation and because of the availability of computer software we use only the unique one.

The symbols and conventions are as follows: "A" represents a general matrix which transforms enrollments into graduations. "G" is its generalized inverse. "B" and "C" are two matrices whose product is A ($A=BC$) and whose inner dimensions are equal to the rank of all three. "x" is a vector of enrollments and "y" a vector of graduates, each disaggregated by discipline, program or labour force category. "m" and "n" are scalars representing vector or matrix dimensions. "r" always represents the rank of a matrix and sometimes a dimension. Lambdas (" λ ") are eigenvalues; "I" is the identity matrix; and "h" is a vector of arbitrary variables with elements $h_1, h_2, \text{etc.}$ "Iff" means if and only if. The word "solution" is used rather loosely in that it sometimes refers to an exact genuine solution and sometimes to an approximation. The precise meaning should be clear from the context.

The Backcasting Problem

Many authors have modeled student flow through school systems² using matrix transformations of the type $Ax = y$ where A_{ij} is the proportion of persons in grade or institution j (often called "state") during the initial time period who move on to state i for a later time period. The vectors x and y represent the number of persons in the various states during the initial and later periods respectively. If the transformation matrix A is square and equal i's and j's represent the same states, then the transformation can be compounded over any number of periods by raising A to higher powers. In the case of square A this is similar to a Markov process except that it is frequently seen as deterministic or prescribed rather than stochastic. Furthermore, dropouts are often treated as a residual in which case $[1]^t A \neq [1]^t$ and populations are not conserved.

*Assistant Professor, Department of Educational Administration, OISE. The author wishes to acknowledge the financial support of the Program in International Education Finance, of the University of California at Berkeley, through a 211d grant from the United States Agency for International Development. He would also like to thank Karim Jaoua for posing the problem.

Frequently educational planners are given this problem in reverse. They are provided with a set of manpower or graduation targets to be met in some future period and must then calculate the enrollments necessary to bring about the required number of graduations. If the transformation matrix A has equivalent row and column states and is square and non-singular, then the solution is obtained by pre-multiplying the graduation target vector y by the inverse of A ($x=A^{-1}y$). It is argued below that A is usually not square and that if it is made square by including all states in both the row and column spaces it will, in general, be singular.

Any square transformation matrix that accurately represents progress through a school or school system is nilpotent and therefore singular. Everyone who enters a school eventually leaves either through graduation, dropout, or death. Thus some power of the matrix A which transforms entrants into graduates must map every entrant vector into a zero graduation vector. The only such matrix is the zero matrix. If $A^n = 0$ then A is nilpotent which is sufficient for singularity.

The addition of an absorbing state to the matrix to collect all the graduates prevents nilpotency but does not guarantee invertibility. In general, if the system contains division points where students flow from one stream equally into two or more streams the transformation matrix is singular.

The problem of backcasting from a vector of graduation targets to the prerequisite enrollments requires a more general formulation than that provided by the standard inverse for a nonsingular square matrix. It is the intention of this paper to show that the problem can be solved using the concept of a generalized inverse matrix³ with properties expressed by equations (1) to (4). A is any matrix and G is its generalized inverse.

$$AGA = A \tag{1}$$

$$GAG = G \tag{2}$$

$$AG = (AG)^t \tag{3}$$

$$GA = (GA)^t \tag{4}$$

The generalized inverse G exists for all A and is unique.⁴ Substitution of A^{-1} for G in the above shows that the definition of G simplifies to the standard inverse for invertible A . For rectangular $m \times n$ matrices, G has dimensions $n \times m$. The inverse of a zero matrix is the zero matrix with reversed dimensions.

The following two sections develop a “generalized inverse” with the properties needed to solve the backcasting problem. This is then shown to be the matrix that satisfies conditions (1) to (4) above.

The Least Squares Criterion

The starting point is the matrix equation $Ax = y$ with A , a given $m \times n$ transformation matrix of rank r ; and y , a vector of graduation targets. The solution set which contains values of the enrollment vector x may be empty. If it is, an approximation to x is desired.

The approximation used is least squares, the solution that minimizes the squared discrepancy between the actual y and the y predicted by x . We wish to select an x that minimizes

$$(y-Ax)^t(y-Ax) \tag{5}$$

$$\frac{\partial}{\partial x} (y-Ax)^t(y-Ax) = -2A^t(y-Ax) = 0 \tag{6}$$

$$A^tAx = A^ty \tag{7}$$

A *deus ex machina* is required at this point because A may not be invertible. This is provided by the singular value decomposition of A.⁵ A is decomposed into two matrices B and C of order m x r and r x n respectively such that A = BC. All three matrices are of rank r. For this reason (B^tB) and (CC^t) are invertible. Substitution of BC for A gives:

$$(BC)^t(BC)x = (BC)^t y \quad (8)$$

Pre-multiplying by C and regrouping gives:

$$(CC^t)(B^tB)Cx = (CC^t)B^t y \quad (9)$$

Because of the invertibility of the leftmost terms the expression reduces to:

$$Cx = (B^tB)^{-1}B^t y \quad (10)$$

Equation (10) gives the least squares solution for x as far as we can take it. It will always exist but may not be unique. There may be an infinite set of x's that reduces the squared discrepancy to zero or to some single positive value.

The Minimum Norm Criterion

To obtain a unique solution another criterion is needed. We choose to minimize the Euclidean norm of x, using the techniques of Lagrange multipliers.

$$L = x^t x + 2\lambda^t (y^* - Cx) \quad (11)$$

$$\text{where } y^* = (B^tB)^{-1}B^t y \quad (12)$$

The symbol y* defined by equation (12) is used for convenience. The constraint in parentheses in (11) is just equation (10). The term 2λ^t is a row vector of Lagrange multipliers with the scalar 2, also present for convenience. Partial differentiation yields equations (13) and (14).

$$\frac{\partial L}{\partial x} = 2x - 2C^t \lambda = 0 \quad (13)$$

$$\frac{\partial L}{\partial \lambda} = 2(y^* - Cx) = 0 \quad (14)$$

From equations (13) and (14) we obtain (15) and (16) respectively.

$$x = C^t \lambda \quad (15)$$

$$y^* = Cx \quad (16)$$

Substituting (15) into (16) gives:

$$y^* = CC^t \lambda \quad (17)$$

$$\lambda = (CC^t)^{-1} y^* \quad (18)$$

Substituting (18) into (15) gives

$$x = C^t (CC^t)^{-1} y^* \quad (19)$$

Finally we substitute (12) into (19) to get rid of y* and give the least squares minimum norm solution.

$$x = C^t (CC^t)^{-1} (B^tB)^{-1} B^t y \quad (20)$$

Equation (20) is now used to define G.

$$G = C^t (CC^t)^{-1} (B^tB)^{-1} B^t \quad (21)$$

Substitution of BC for A and the right side of (21) into equations (1) to (4) will convince the reader that the above expression satisfies the definition of the unique generalized inverse.

Some Generalized Inverse Properties

A number of important results, which are used later, follow from the definition of G (21) and the fact that $A = BC$. These are listed below:

$$AG = B(B^tB)^{-1}B^t \tag{22}$$

$$GA = C^t(CC^t)^{-1}C \tag{23}$$

$$(GA)^2 = GA \tag{24}$$

Note that AG and GA are $m \times m$ and $n \times n$ matrices, respectively. Equation (24), which can be derived by squaring (23), shows that GA is an idempotent matrix. Pre-multiplication of (24) by $(GA)^{-1}$ demonstrates that the only non-singular idempotent matrix is the identity matrix. Squaring of $(I-GA)$ followed by the application of (24) can be used to prove that $(I-GA)$ is also idempotent, an important result for the next section. Similarly, (AG) and $(I-AG)$ are idempotent. The expressions for GA and AG can be used to show that GA, AG, $(I-GA)$, and $(I-AG)$ are all symmetric.

The expression for G (21) gives us the least squares minimum norm solution to the equation $Ax = y$ as follows:

$$x = Gy \tag{25}$$

But what is really needed is a solution to equation (10), that is, the set of all x for which the squared discrepancy $((y-Ax)^t(y-Ax))$ reaches its minimum value. If the minimum squared discrepancy is zero, the solutions are exact; otherwise they are approximate. Either may be unique or indeterminate. The general least squares solution is presented in the following section followed by a proof that it exactly represents the complete solution to equation (10).

The General Least Squares Solution

The complete least squares solution to x is as follows:

$$x = Gy + (I - GA)h \tag{26}$$

where h is an arbitrary $n \times 1$ column vector. This is proven in two steps. Firstly, it is proven that (26) satisfies (10) and secondly, that for every x satisfying (10) there is at least one h such that x also satisfies (26).

The first step begins with the substitution of (26) into (10).

$$C(Gy + (I - GA)h) = (B^tB)^{-1}B^ty \tag{27}$$

Substituting (23) for GA and (21) for G gives the following expression for the left hand side

$$C(C^t(CC^t)^{-1}(B^tB)^{-1}B^ty + (I - C^t(CC^t)^{-1}C)h) \tag{28}$$

Removing the outer parentheses and removing $CC^t(CC^t)^{-1}$ in two places results in considerable simplification.

$$(B^tB)^{-1}B^ty + (CI - C)h \tag{29}$$

The right term disappears leaving (29) identical to the right hand side of (27). Thus our expression for x, (26), is a solution to (10). We now must prove that (26) is the complete solution.

Starting with equation (10) we show that every x that is a solution is also a solution to (26) for some h . Pre-multiplying (10) by GB gives:

$$GBCx = GB(B^tB)^{-1}B^ty \quad (30)$$

Substituting A for BC in the left hand equation (22) in the right gives:

$$GAx = (GAG)y \quad (31)$$

Substituting (2) into the right and re-arranging yields:

$$0 = Gy - GAx \quad (32)$$

$$x = Gy + x - GAx \quad (33)$$

$$x = Gy + (I - GA)x \quad (34)$$

Thus any x substituted for h satisfies equations (26) and (10). This does not imply that x can be generated only by itself. The h corresponding to any given x is usually not unique.

In the formula $x = Gy + (I - GA)h$, the first term on the right is the solution corresponding to $h = 0$. It is also the minimum norm solution as shown in (25). The second term provides for all other solutions. Interpreting this as a solution to a system of linear equations, we see that the first term is a particular solution (exact or approximate) of the inhomogeneous system and the second term is the general solution of the homogeneous system. Attention is now concentrated on the second term in order to determine whether the solution is unique, and if not, how many elements there are in the arbitrary vector, h .

The Indeterminacy of the Solution

In this section it is first shown that the rank of GA is equal to the sum of its diagonal elements, called its trace. The proof depends only on GA 's symmetry and idempotency so that we can also apply the finding to I and $(I-GA)$. This is followed by three simple proofs, that $\text{rank}(GA) = \text{rank}(A)$, that $\text{rank}(I-GA) = n - \text{rank}(GA)$ and finally that $\text{rank}(I-GA) = \text{nullity}(A)$. We conclude that the columns of $(I-GA)$ form a basis for the null space of A and that the rank of $(I-GA)$ equals the minimum number of elements in the arbitrary vector h .

Since GA is real, square ($n \times n$), and symmetric it is Hermitian, from which a number of important results follow. The eigenvectors of GA are all linearly independent and, in fact, are orthogonal.⁵ GA can be reduced to diagonal form by a transformation that is both a similarity and a unitary transformation.

$$D = Q^{-1}(GA)Q \quad (35)$$

$$\text{or } D = Q^t(GA)Q \quad (36)$$

such that,

$$Q^t = Q^{-1} \quad (37)$$

Q is an orthonormal matrix and D is an $n \times n$ matrix containing the eigenvalues of GA in the diagonal and zeros elsewhere.⁵

By pre-multiplying the equation for eigenvalues, $(GA - \lambda I)v = 0$, by GA and substituting GA for $(GA)^2$ the reader can derive the equation $(1 - \lambda)(GA)v = 0$ and conclude that either $\lambda = 1$ or $GA v = 0$, in which case $\lambda = 0$. Thus the eigenvalues are all zeros and ones.

Consider the relationship between the ranks and eigenvalues of GA and D . The rank of D is equal to the rank of GA because multiplication of a matrix (GA) by non-singular matrices (Q^{-1} and Q) does not change its rank.⁵ The rows of the diagonal matrix D can be interchanged to put the identity matrix into the upper left corner and zeros everywhere else. From this it becomes clear that the rank of D is equal to the sum of its eigenvalues. The same conclusion holds for GA since D and GA have the same eigenvalues.

This brings us to an important finding which applies to all symmetric idempotent matrices. Because the sum of the eigenvalues of any square matrix is equal to its trace⁴, the rank of GA is equal to its trace. This provides a simple computational technique for determining the rank of GA and $(I-GA)$, both of which are symmetric and idempotent.

Since the trace of a matrix difference is equal to the difference of the traces, the rank of $(I-GA)$ is equal to $\text{rank}(I) - \text{rank}(GA)$ or $n - \text{rank}(GA)$.

It is well known that for any G and A conformable for multiplication $\text{rank}(GA) \leq \text{rank}(A)$.⁵ Applying this same principle to equation (1) grouped as $A(GA) = A$, we can conclude that $\text{rank}(GA) \geq \text{rank}(A)$. Therefore, $\text{rank}(GA) = \text{rank}(A)$. By similar reasoning it can be shown that all of A , G , GA , and AG have the same rank, as do B and C .

We can now combine these findings to reach the final conclusion of this section. The general solution contains a matrix $(I-GA)$ whose rank is equal to its trace. Furthermore, its rank is equal to $n - \text{rank}(GA)$ or $n - \text{rank}(A)$. But $n - \text{rank}(A) = \text{nullity}(A)$ by Sylvester's Law of Nullity.⁶ Therefore, the trace and rank of $(I-GA)$ are equal to the nullity of A . By pre-multiplying $(I-GA)h$ by A and substituting A for AGA (2) we see that all vectors of the form $(I-GA)h$ are mapped into the zero vector by A . Thus, they are in the null space of A . Because $(I-GA)$ has the rank of the null space of A , $(n - \text{rank}(A))$, it must have exactly $(n - \text{rank}(A))$ linearly independent columns. The columns of $(I-GA)$ therefore form a basis for the null space of A .

Unfortunately, this is not a minimal basis for the null space of A ; it contains n vectors but only $(n - \text{rank}(A))$ linearly independent ones. This form of $(I-GA)$ does not provide much insight into the structure of A 's null space, a practical and computational problem which is discussed in the section on computation.

The Approximateness of the Solution

This section examines the circumstances under which the equation $Ax = y$ yields exact and approximate values for x . First, an expression for the squared discrepancy that depends only on y and A is derived. This is used to define three possible outcomes for a given A and the set of all y .

The squared discrepancy is $((y-Ax)^t (y-Ax))$ which is minimal when $x = Gy + (I-GA)h$. Substituting the expression for x in the expression for the squared discrepancy gives:

$$(y-A(Gy + (I-GA)h))^t (y-A(Gy + (I-GA)h)) \quad (38)$$

This expression can be simplified by substituting zero for $A(I-GA)$.

$$(y-AGy)^t (y-AGy) \quad (39)$$

$$y^t y - y^t(AGy) - (AGy)^t y + (AGy)^t AGy \quad (40)$$

This can be simplified by noting that each term is a scalar and, therefore, equal to its transpose and that AG is symmetric and idempotent.

$$y^t(I-AG)y \tag{41}$$

Equation (41) is the expression we seek, the minimum squared discrepancy for a given A and y. Exact solution(s) exist when (41) is equal to zero.

To examine the conditions under which (41) is equal to zero it is necessary to use the fact that a non-negative quadratic form is equal to zero if, and only if, the vector valued expression produced by removing the prepositioned vector from the quadratic form is zero.

The proof of this involves the diagonalization of (I-AG) and the transformation of y and y^t into z and z^t by the orthonormal matrix of eigenvectors.

$$y^t(I-AG)y = y^tQ^{-1}DQy \tag{42}$$

We define z as Qy. Since Q is orthonormal z^t = y^tQ⁻¹. The expression becomes

$$z^tDz \tag{43}$$

where D is the diagonal matrix of eigenvalues of (I-AG). This expression is a scalar and can be written as follows:

$$z^tDz = z_1(\lambda_1 z_1) + z_2(\lambda_2 z_2) + \dots \tag{44}$$

where the subscripted z's represent elements of the vector z. Clearly (z₁(λ₁ z₁)) = 0 if and only if λ₁z₁ = 0. Since the eigenvalues are all non-negative the expression (z₁ λ₁ z₁) must also be non-negative. Thus, the quadratic form can equal zero only if every term on the right hand side of (44) is zero, which means that every λ₁ z₁ = 0. This is the key to the proof. It means that:

$$y^tQ^{-1}DQy = 0 \text{ iff } DQy = 0$$

Since Q⁻¹ is non-singular,

$$DQy = 0 \text{ iff } Q^{-1}DQy = 0$$

Combining (45) and (46) and substituting (I-AG) for Q⁻¹DQ completes the proof.

$$y^t(I-AG)y = 0 \text{ iff } (I-AG)y = 0$$

We can now proceed to examine the conditions under which exact solutions exist. There is an exact solution for all y such that

$$y = AGh \tag{48}$$

The first stage of the proof verifies that any y satisfying (48) will result in a zero value for (41), the squared discrepancy. Substituting (48) into (41) gives:

$$(AGh)^t(I-AG)AGh \tag{49}$$

Multiplying (49) through by the post positioned AG and application of (1) results in a zero value for the expression.

The second stage of the proof shows that an h exists for every y that results in a zero value of (41). This time the expression (I-AG)y from (47) is set to zero, rather than the corresponding quadratic form. Manipulation of this expression quickly shows that:

$$y = AGy \tag{50}$$

This completes the proof. Since AG is generally singular, y is not the only value of h that will generate y.

Figure 1 THE EXEMPLARY PROBLEM

$$A = \begin{bmatrix} .040 & .360 & .264 & .136 \\ .210 & .050 & .098 & .162 \\ .440 & .090 & .195 & .335 \\ .110 & .400 & .313 & .197 \\ .200 & .100 & .130 & .170 \end{bmatrix}$$

$$y_1 = \begin{bmatrix} 232.0 \\ 114.0 \\ 230.0 \\ 284.0 \\ 140.0 \end{bmatrix}$$

$$y_2 = \begin{bmatrix} 156.0 \\ 124.0 \\ 10.0 \\ 356.0 \\ 354.0 \end{bmatrix}$$

Figure 2 THE SOLUTION TO THE EXEMPLARY PROBLEM

$$x_1 = \begin{bmatrix} 163.7931034403 \\ 336.2068965517 \\ 284.4827586207 \\ 215.5172413793 \end{bmatrix}$$

$$x_2 = \begin{bmatrix} 7.0150228240 \\ 438.2673758972 \\ 309.1316699753 \\ 136.9507287460 \end{bmatrix}$$

$$y_1^t (I-AG)y_1 = [0.]$$

$$y_2^t (I-AG)y_2 = [95344.7]$$

$$(I-GA)h = \begin{bmatrix} .3189655172 & .1810344828 \\ .1810344828 & .3189655172 \\ .0775862069 & -.4224137931 \\ -.4224137931 & -.0775862069 \end{bmatrix}$$

$$\begin{bmatrix} -.0775862069 & -.4224137931 \\ -.4224137931 & -.0775862069 \\ .6810344828 & -.1810344828 \\ -.1810344828 & .6810344828 \end{bmatrix} \begin{bmatrix} h_1 \\ h_2 \\ h_3 \\ h_4 \end{bmatrix}$$

$$(I-GA)h \text{ reduced} = \begin{bmatrix} 1.0000000000 & 0. \\ 0. & 1.0000000000 \\ .7500000000 & -1.7500000000 \\ 1.7500000000 & .7500000000 \end{bmatrix} \begin{bmatrix} h_1 \\ h_2 \end{bmatrix}$$

The results for solution approximateness can be summarized into three cases, the first of which is trivial.

If $AG = 0$ the only y yielding an exact solution is the zero vector. Inspection of (1) shows that $AG = 0$ if and only if $A = 0$.

From equation (41) it is clear that if $AG = 1$, there is an exact solution for all y . Since AG is $m \times m$ and idempotent this can occur only if the rank of A is m .

The intermediate cases are those for which the rank of AG is greater than zero but less than m . These yield exact solutions for those y that satisfy (50) and approximate solutions for all other values of y .

Computation

This section contains an example of an enrollment backcast and some hints on computation.

The example was solved with a program of 50 Fortran statements that input the transformation matrix (A), the target vector (y), and then called widely available subroutines to do the rest. The subroutines, including one that calculates the unique generalized inverse of a matrix by means of singular value decomposition,⁵ are a part of the International Mathematical and Statistical Library.⁷ This library also contains subroutines to do the other matrix and vector operations necessary to calculate and output the complete solution.

The problem and solution are contained in Figures 1 and 2, respectively. The problem consists of one transformation matrix (A) and two graduation target vectors, y_1 , and y_2 , which generate two least norm solutions, x_1 and x_2 , respectively. The general solution to the homogeneous problem is the same for all y , given A .

The information in Figure 2 permits us to analyze the solutions. The matrix $(I-GA)$ is 4×4 with a trace of 2. Its rank is, therefore, 2 and from this GA has a rank of $4 - 2 = 2$. A and AG are of rank 2. $(I - AG)$ is 5×5 and has a rank of $5 - 2 = 3$. We conclude that there will be an infinite number of least squares solutions, some exact and some approximate depending on y . The expressions for $y^t(I-AG)y$ show that y_1 has exact solutions and y_2 has approximate solutions.

The matrix $(I-GA)$, which is a redundant basis of the null space of A , can be converted to a more convenient form by removing the unnecessary vectors. A systematic way to do this is to reduce it to row echelon form (also known as Hermite normal form) and transpose it. After discarding the zero columns this gives a basis of $(n - 4)$ column vectors with the identity matrix in the top $(n - r)$ rows as shown at the bottom of Figure 2.

Two undesirable types of enrollment vectors are often generated. The least serious and most common contains non-integer enrollments that can be rounded. Negative enrollments may occur in either the least norm or the general solution.

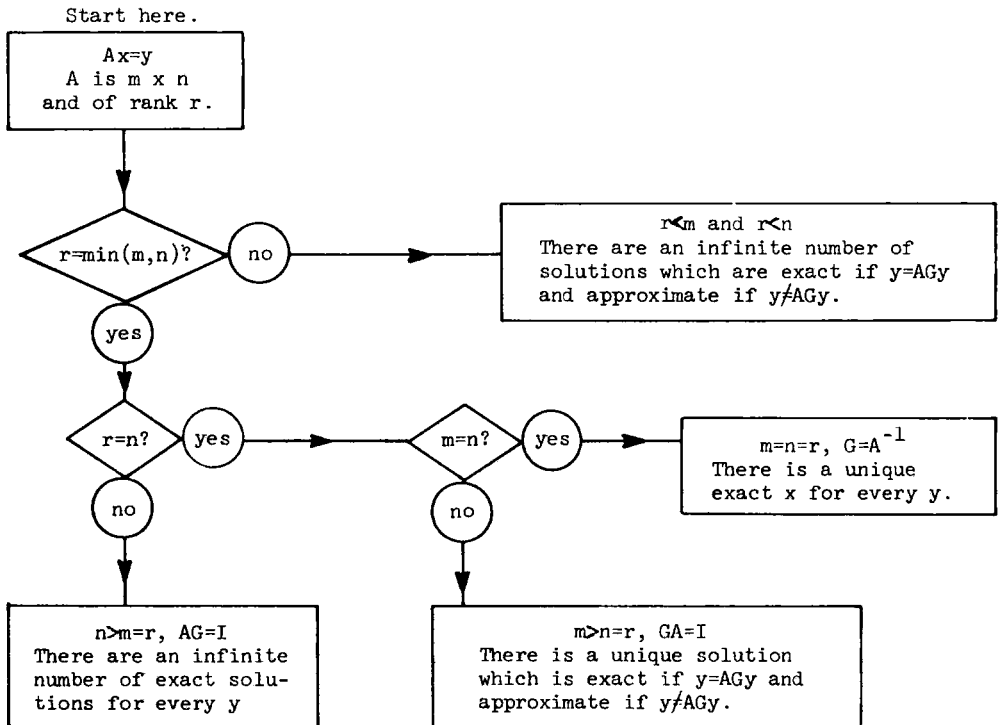
The number of enrollment vectors in any solution will be finite if only vectors with non-negative integer enrollments with a finite maximum sum are considered.

Conclusion

The enrollment backcasting problem $Ax = y$ has been solved. The complete exact or approximate solution is $x = Gy + (I-GA)h$ where G is the generalized inverse of A and h is an arbitrary vector whose minimum dimension is equal to the nullity of A . The solu-

tion is exact if $y^t(i-AG)y = 0$; otherwise, it is a least squares approximation. Figure 3 summarizes the rank and order analysis of the solution.

Figure 3 ANALYSIS OF THE GENERAL SOLUTION BY MEANS OF RANK AND ORDER INFORMATION



NOTE: "G" is the unique generalized inverse of A.

REFERENCES

1. Karim Jaoua, *et al*, *Vers Une Meilleure Orientation Scolaire et Universitaire*. Berkeley, Ca.: Program in International Education Finance, University of California. 1974.
2. For a review, see James N. Johnstone, "Mathematical Models Developed for Use in Educational Planning", *Review of Educational Research*, vol. 44. no. 2. Spring, 1974, pp. 177-201 or Ernesto Schiefelbein and Russel Davis, *Development of Educational Planning Models and Application in the Chilean School Reform*. Lenington, Mass.: D.C. Heath. 1974.
3. See Adi Ben-Israel and Thomas Greville, *Generalized Inverses: Theory and Applications*. New York: John Wiley, 1974; Thomas L. Boullion and Patrick L. Odell, *Generalized Inverse Matrices*. New York: Wiley-Interscience, 1971; and C.R. Rao and S.K. Mitra, *Generalized Inverse of Matrices and Its Applications*. New York: John Wiley, 1971.
4. Franklin A. Graybill, *Introduction to Matrices With Applications in Statistics*. Belmont, Ca.: Wadsworth, 1969, p. 97, 223.
5. Ben Noble, *Applied Linear Algebra*. Englewood Cliffs: Prentice Hall, 1969, pp. 338, 321, 318, 138, 139 and pp. 335-340.
6. Philip Gillett, *Linear Mathematics*. Boston: Prindle, Weber & Schmidt, 1970, p. 154.
7. IMSL. *Library 3 Reference Manual*. (4th edition). Houston, Texas: International Mathematical and Statistical Library, 1974.

FORECASTING NOTES – II

Introduction

This note reviews a method of forecasting school enrollment which is in common use by local school authorities in the United States and Canada, a method based on pupil yield ratios related to housing characteristics. During the mid 1960s the method was given a fillip, and gained some academic respectability, by being the subject of a series of studies and graduate student theses. That literature suffers in that it was produced when school systems were experiencing rapid expansion, due not only to a “crest” of numbers flowing through the schools (numbers derived from the earlier “baby boom”) but even more to uneven development caused by the explosive proliferation of new housing sub-divisions on the edge of metropolitan centres. Most of the literature urges the desirability of being able, by wise forecasting, to anticipate school building needs before the housing sub-division is built, so that the schools will be ready for occupancy when the houses are. It also urges the need for long range forecasts so that school plant will not be over-built (or under-built) for the optimum school population expected.

It would be unfortunate if young planners, working in contracting rather than expanding local school systems, dismissed this literature as irrelevant. We shall briefly comment on a few of the better publications, describe the forecasting method and the assumptions on which it is based, and discuss its applicability today.

The school planner working in the early 60s faced two questions. In the literature they are often confused so it would be helpful to state them separately from the outset. They are not, of course, independent of each other. But it is the first question which needs to be re-formulated for today’s conditions. The problems are:

- How to estimate the total number of dwelling units in a given geographic area, and
- How to estimate the school pupil yield from the first estimate.

The planners of the 60s faced the first question for areas which were “blank” on the map – farm land which had not yet been brought into urban housing use. There are a number of ways in which this calculation can be made. It is greatly simplified where the superior jurisdiction (state or province in the examples we shall consider) has enacted land use control legislation, so that departures from current use must be suggested within some overall land use plan. In Ontario, for example, under the Planning Act municipalities must register their land use plans and Ministry approval must be gained not only for the initial overall official plans but also for departures therefrom. Zoning categories indicate various general uses (industrial, commercial, residential, public, parkland) and the approximate population or family densities permitted within each use. There are a series of well-known approval procedures for registering (with the municipality) a plan of sub-division and, eventually, obtaining building permits to begin construction. By using the plan proposals the school planner can refine his first rough calculations to obtain a fairly

*Professor, Department of Educational Planning, OISE.

The author wishes to acknowledge that the projection work on which this note is based is carried on not primarily by her but by a team of colleagues. This note is based on the work of Mr. Saeed Quazi and Dr. Ramesh Kumar.

precise stock count of dwelling units of an area before the construction work actually starts. He can plan his school buildings in parallel with the planning for the housing of the children who will use the school. In the 60s his major hazard in some jurisdictions was that land use planning was not taken very seriously by municipal authorities and spot rezoning changes in the original plans yielded a quite different community (in terms of housing stocks) than that originally envisaged. In the past three years the planner has faced another hazard, economic conditions (particularly the fluctuations of the interest rate) have affected the *pacing* of the construction and sale of new housing, so that although his overall estimates of housing stocks were correct the figures expected in specific years were not.

The common condition now faced by the school planner working in an urban area is that the housing is *in situ*, there are no "empty" spaces. The precise tabulation of his housing stock can be done by a survey. In some of the American states this type of census is required, periodically, by law. In most parts of North America (Ontario is one) detailed data are provided from the annual property assessment records, which show not only the type of building at a given location but also its value, ownership, type of occupancy (owner-occupied, rental, public housing rental, condominium etc.), the age and sex of its occupants and whether they are assessed as "public" or "separate" (Roman Catholic) school supporters. In these conditions the planner is less concerned with current housing stocks than with future stocks, and less concerned with the current use of the housing than with its future use. To adjust to short term future changes he can keep track of building permits issued by the building department of the municipal authority. For the long term changes he needs to address the second question above and look at long term population trends.

In an existing fully built urban area the housing stocks age slowly, changes are incremental (except for sweeping urban renewal schemes which involve large scale demolition; these usually are heralded by several years of advanced planning so their approach is well documented, and, in any case, they are rapidly becoming replaced by urban renewal which is piecemeal and renovative rather than wholesale and destructive). Over time, the housing stock is virtually unchanged but its use has radically changed. What we have is a version of the turnover problem and, therefore, it is the second question – that of pupil yield – which is crucial for the planner.

The analytical basis of the housing yield method of estimating school enrollment is a simple accounting relationship. Assume that we are concerned with a clearly defined closed community in the sense that students from other neighbouring communities or areas do not normally attend the schools lying within the community under consideration. If N is the total number of dwelling units and a the average number of students per dwelling unit, then student enrollment at time t would be expressed as:

$$E_t \equiv a_t \cdot N_t \tag{1}$$

Equation (1) assumes that the housing yield (i.e., the homes-to-pupils) factor, a_t , is the same for all types of dwelling units. This assumption is not realistic. Dwelling units (households) differ from each other in a number of ways. The same type of unit may house one or several persons. A "single household" may be an actual family consisting of a number of people or a bachelor. Dwelling units of the same type differ in other characteristics, the size of the plots of land may be identical but the proportion of building-to-land varies, the total size of the building be identical but the number of bed-

rooms vary. The dwelling unit may be old and have a long history of types of occupancy, or of recent construction with only one recorded occupancy, so that its potential futures are unknown. It is possible to distinguish dwelling units by a number of categorization schemes. Housing “yield” may easily vary according to the scheme used.

Let us assume that, on the basis of some criterion, the total number of households of our area can be subdivided into G mutually exclusive sets or groups such that N_i represents the number of dwelling units in the group i ($i = 1, 2, \dots, G$), then the student population at time t , may be rewritten as:

$$E_t \equiv a_{1t}N_{1t} + a_{2t}N_{2t} + \dots + a_{G,t}N_{G,t} \quad (2)$$

The subscript t denotes time, and $a_{1t} \dots, a_{G,t}$ are respectively the housing yield factors for the G groups.

Since both (1) and (2) are accounting relations, N must represent the total number of dwelling units in the community, and the G groups of households $N_1, N_2 \dots, N_G$ be mutually exclusive and totally exhaustive. The groups may be identified by a single housing characteristic or a combination of characteristics. The literature on this subject, which generally is only of an exploratory nature, suggests a large number of characteristics. Dwelling units could be distinguished on the basis of common types used for zoning – detached and semi-detached conventional single family houses; row house, duplex, multiplex or apartment. They could be distinguished by size (cubic footage or square footage of floor space), or the number of bedrooms. They might be distinguished by the age of the structure. A characteristic frequently used for apartments, row houses and maisonettes is type of ownership. More than one basis for categorization may be used for each sub-type of dwelling used and some studies have tried to forecast from a complex set of characteristics, others from a single indicator. The decision often is dictated by the type of data readily available. This should not be. If data are available such that we can arrange the current student population in an $n \times n$ ($n = 1, 2, \dots$) classification employed in analysis of variance, or contingency tables, then the application of the analysis of variance technique can help identify the most significant housing characteristics. These can in turn be combined to generate the criterion for classifying the dwelling units into groups. What must be kept in mind is that the groups are distinguished on the basis of the assumption that they will yield significantly different homes-to-pupils factors.

Forecasting enrollment on the basis of equations (1) and (2) is conceptually as simple as the equations themselves. Since equation (2) is the more general we shall confine our discussion to it. Projections of future enrollment depend upon the forecasts of N_{it} (the number of dwelling units in each group) and a_{it} (the housing yield, or homes-to-pupils, factor for each group). Let us assume, for the moment, that the homes-to-pupils factors, the a_{it} 's ($i = 1, 2, \dots G$), are constant over time. If we have data for only the current year, as is so often the case, this assumption is a necessary one. Then the enrollment forecast for subsequent years, $t+r$ ($r = 1, 2, \dots$), would be expressed by:

$$\hat{E}_{t+r} \equiv a_1\hat{N}_{1t+r} + a_2\hat{N}_{2t+r} + \dots + a_G\hat{N}_{Gt+r} \quad r = 1, 2, \dots \quad (3)$$

where \hat{N}_{it+r} = estimated number of dwelling units in group i ($i = 1, 2, \dots G$) in the year $t+r$ ($r = 1, 2, \dots$), and the subscript t has been removed to denote that the housing yields remain constant over the forecast period.

The accuracy of enrollment forecasts made on the basis of relation (3) will depend upon how well we are able to estimate the N_{it+r} 's. The procedure is simple and quite accurate if we are concerned with a community which has already reached saturation and has fairly strict by-law controls over the use of housing stocks. If no new residential units are to be built in the few years of a short range forecast, all that is needed is an estimate (based on local government records or a survey) of the expected number of years of "life" a dwelling unit will average. The estimated life expectancy of dwelling units may be different for different groups. The forecasts can be made only for the length of time which represents the lowest figure among the estimated life expectancies of different groups of dwelling units. It is also obvious that forecasts thus obtained will be very similar to those observed for the most recent year. Therefore we have not made much headway with the solution to our problem. The source of trouble arises not with the assumption of saturation with regard to residential construction, but the assumed constancy of the housing yield ratios—i.e., that the controls will ensure that each unit of stock is used in exactly the same way. In fact, it can be argued *a priori* that housing yield ratios will steadily decline over time in such a community because the occupants age and, therefore, a portion of the student population "grows out" of our enrollment each year. The only case in which the forecast will be valid is a community with no change in the use of dwelling house stocks except for an annual migration inflow of young children which will exactly compensate for the "aging" of current year stocks of children.

The usual condition in a "saturated" community is that some residential construction is going on; there is some re-zoning, changed dwelling use and some replacement. Therefore careful and precise estimation of the number of dwelling units in each group is required since units counted in one group in the current year may have to be counted in another group in the future. All changes in stocks must be counted—the number of dwelling units removed because of age or change in land use and the number added by changed use, by construction or conversion. For estimating these quantities, municipal or local government records are helpful. The method of estimating the N_{it+r} 's is as follows:

$$\hat{N}_{it} \equiv N_{it-1} + R_{it} + C_{it} \quad (i = 1, 2, \dots G) \quad (4)$$

where N_{it-1} = the number of dwelling units in group i the previous year,
 R_{it} = the number of net units removed in group i because of wrecking, remodelling, alterations, and rezoning (R_{it} can be negative or positive depending upon the changes.)
 C_{it} = the number of units added by new construction.

However, enrollment forecasts obtained with the use of equations (3) and (4) generally still are not accurate because the assumption of stationary a_i 's cannot be satisfied.

So the solution which planners for local boards adopt is to look at housing yield ratios for a number of years to ascertain trends. If trends are discernible, trend curve analysis may be used to identify the nature of trends and estimate the future values of the housing yield ratios. When the housing yield ratios are also estimated, the enrollment forecasts can be obtained from the following:

$$\hat{E}_{t+r} \equiv \hat{a}_{1,t+r} \hat{N}_{1,t+r} + \dots + \hat{a}_{G,t+r} \hat{N}_{G,t+r} \quad (r = 1, 2 \dots) \quad (5)$$

Cicely Watson

where $\hat{a}_{i,t+r}$ and $\hat{N}_{i,t+r}$ ($i = 1, 2, \dots, G; r = 1, 2, \dots$) are independently obtained forecasts of housing yield ratios and the number of dwelling units respectively.

Studies on Housing Yield

The ERIC reference shows a large number of papers describing housing surveys conducted to solve a number of problems in the planning and administration of schools, but description of five is sufficient to show the state of the art in their use for enrollment forecasting. The reports we have chosen are those by Ellene, Joos and McLaulin, for the office of Education of the U.S. Department of Health, Education and Welfare (in 1962)¹; by Murray V. Jones and Associates, for the Etobicoke Board of Education, in suburban Metropolitan Toronto, Ontario (in 1966);² and by Holley, for the American Society of Planning Officials (in 1966);³ the Andress M.A. thesis using data of the city of London, Ontario (in 1967);⁴ and the PhD dissertation of W.F. Gibbs (1966),⁵ which is by far the best and most thorough treatment of the subject.

The Ellene-Joos-McLaulin study set out to “(1) develop a technique for estimating pupil yield by types of dwelling units which would be applicable in many metropolitan school districts and (2) derive specific pupil yield figures by types of dwelling units for Baltimore county, Maryland”. By a door to door census of approximately 116,000 dwelling units, carried out by some 3200 volunteers, the authors collected data on student population and a number of housing characteristics: type of dwelling unit, assessed value of the unit, number of bedrooms, age of the unit etc. Pupil yields were computed in the manner described above and the data cross classified. By analysis of variance, the authors found that:

- Pupil yield per dwelling unit varies by area of the county.
- Pupil yield per dwelling unit varies by type of unit.
- Pupil yield per dwelling unit varies according to the number of bedrooms in the unit.
- Pupil yield per dwelling unit varies according to the value of the unit.
- Pupil yield per dwelling unit varies according to the size of the lot upon which the unit is located.

For every type of dwelling unit tested, there were highly significant differences between the pupil yield for different levels of the school system. Since this was an exploratory survey, the publication made no attempt to forecast future enrollments from these data. It is not clear whether Baltimore County have been basing their enrollment projections since 1962 on this data base. At least there is no published report describing the work and discussing its error record.

The Andress study was designed to assess the impact of apartment building and townhouse development on the schools of the City of London. Its results generally corroborate those of the Baltimore survey. It found not only that apartment buildings (particularly the walk-up type) generated significantly higher pupil yields than conventional townhouse developments, but also that yields were positively related to the number of bedrooms per dwelling unit.

Paul Holley's report summarized the results of seventeen studies which had been conducted by various boards of education in the United States and Canada and concluded that:

- Apartment units (which are inconvenient for child-rearing) have fewer children in elementary school.
- Three-bedroom units yield a sizeable number of school-aged children.
- The number of children per unit increases as the proportion of units on the ground level is increased.
- Luxury apartments yield few pupils when constructed, but can be expected to attract more families with children as the buildings age.
- The community's financial return from the local taxes on apartments is a relatively poor basis for making zoning decisions. Instead attention should be focussed on the quality of the development and the degree to which it will continue to provide suitable living accommodation for the citizens of the community in the years ahead.

The Murray V. Jones study was directly concerned with forecasting enrollment for the public elementary and secondary schools of Etobicoke borough for the years 1966 to 1975 inclusive. The forecasts were based on pupil yields computed separately for single detached dwellings and for apartments, cross classified by school attendance area, and the age, size and number of bedrooms in the units. The estimated future number of dwelling units in each group was based on demolition of old units and new construction as reported by the local planning board. The study suffers from data problems as well as shortcomings of methodology. It largely ignores changes occurring because of migration and provides no justification for the dwelling unit classifications utilised. However, its greatest weakness for current use is that it ignored public housing, because at that time there was no public housing in Etobicoke. Public housing now accounts for a substantial part of school enrollment in all large urban areas.

Gibbs' doctorate was obtained from Northwestern University. The main purpose of his thesis was to provide a framework for evaluating the effects (in terms of additional school enrollment) of the rezoning plans of District 68 of Cook County, Illinois. He too used a door-to-door-census of dwelling units to provide the data to establish the following hypotheses, by means of stepwise regression analysis:

Age of Building

- (1) Newer houses and townhouses will have younger children than older townhouses and houses (this was not confirmed).
- (2) Newer houses will have more children than older houses (confirmed).
- (3) Newer apartments have fewer children than older apartments (confirmed).
- (4) Newer apartments have younger children than older apartments (not confirmed).

Assessed Value

- (5) Less expensive units have fewer children than more expensive units (confirmed).
- (6) Less expensive units have younger children than more expensive units (confirmed).

Bedrooms

- (7) Units with a larger number of bedrooms will produce more children than units with fewer bedrooms (confirmed).

Building Type

- (8) Single family residences and townhouses will produce the same number of children (confirmed).

- (9) Single family units and townhouse units will have more children than apartment units (confirmed).

Gibbs' most interesting observations come from his hypotheses regarding assessed values, i.e., (5) and (6). In the absence of any other information, it is difficult to argue *a priori* that less expensive dwelling units will generally have fewer and younger children than the more expensive units. Since large families require larger living space, if all other factors are the same, such units would cost more. The hypotheses, therefore, might well be reflecting the effects of a variable like the size of the structure, or the income of the occupant. Although most of the hypotheses tested by Gibbs and the other reports mentioned were confirmed by the data, basically they are *ad hoc* postulates. These postulates can be granted no causal credence unless we can argue, on an *a priori* basis, that a correlative or causal relationship *does* exist between the housing yield factor and the variable under consideration. Before we attempt to deal with this, it would be useful to show a few results of the findings of these studies to demonstrate the yield factors and the range of values for these factors.

Tables 1 and 2* show the pupil yields obtained by Murray V. Jones for the Etobicoke Board of Education. Tables 3 and 4 are yields obtained by Gibbs for school district 68 of Cook County. The two sets of figures are not directly comparable, of course. Since Gibbs includes all children aged 17 or less, regardless of whether or not they are attending school, his estimates necessarily are larger. Table 4 is less detailed than Table 5, which appeared in the Baltimore report. The latter shows the yield on single dwelling units only, by assessed value and number of bedrooms. Tables 6 and 7 which are taken from the Holley report, enable the reader to quickly see the variance in yield from a group of community studies.

Causal Explanations of Different Housing Yields

In the discussion thus far, our attention has been focussed mainly on the definition of, and the computation of, housing yield (homes-to-pupils) factors. We have recognized that such ratios may be different for different types of dwelling units but we have not yet considered the causes of variation in housing yield factors which occur either within a homogenous group of units (or between groups) or over a period of years. We shall now briefly identify some of the demographic, socio-economic and housing characteristics which are likely to affect the magnitude of the ratios.

Housing Factors

The size and type of structure. The actual size of the housing unit is an important variable, but it is evident that size is taken into account in conjunction with other factors. Square footage which is divided into a large number of bedrooms is more useful for housing a number of children than the same space encompassed in fewer bedrooms (particularly depending upon the mix of children by age and sex). Families with small children, where they have a choice, prefer small, low-rise structures or units at ground level to large high-rise ones. They prefer buildings which have private outside exits for each unit (e.g., single family houses, townhouses) to those with common entrances and corridors. Families with young children prefer neighbourhoods or housing developments which have open

*Tables are at the end of the article.

playgrounds, so (subject to price) such developments attract more children per dwelling unit. Size of the structure may be measured by a number of variables—lot frontage, proportion of open space, height of building, type of building, number of outside exits (of multiple family building), number of bedrooms per unit, square footage per unit.

The age of the building. For a short period, particularly with new single family dwellings, as the structure ages it houses more children. For multiple family dwellings this condition goes on much longer. People buy family houses to house children. People buy or rent new apartments because they are attractive and offer good amenities. But new buildings attract high rents. And high rents do not attract large families. Moreover because of their desirability, new buildings permit the apartment owner to be highly selective in choosing tenants. Even where there is ability to pay high rent, an owner does not look with favour on large families with young children because they engender high maintenance costs. As the building ages, on the other hand, its desirability declines (along with its rents, quite often), and so does the owner's freedom to select tenants.

The type of ownership. Families with young children like to own the dwelling unit they occupy. However ownership is closely linked with income so the data may show that, in many communities, such preferences cannot be made by large families.

The type of rental. For families renting accommodation, the inverse may well be true: the smaller the family the higher the probability of renting; the lower the income, the higher the probability of renting; but, on the other hand, the lower the income the larger the family size. It is clear that, for rental accommodation in particular, the *type* of rental and the level of the rent are important intervening variables. Luxury apartments yield few elementary school-aged children. Limited dividend and public assisted rented housing yield a large number.

The number of bedrooms. As the number of bedrooms in a dwelling unit increases, the number of pupils and students (i.e., both elementary and secondary school clients) per unit increases. But, beyond a certain number of bedrooms, the relationship reverses. A study carried out in North York (another suburban borough of Metropolitan Toronto) found that the relationship did not hold for units with more than three bedrooms. A study of the Chicago Housing authority, on the other hand, found that the yield continued to increase for units with four and even five bedrooms.⁶

The distance of the dwelling from the school building, and/or the downtown core.

The nearer the unit is to a school, the more likely it is to have, on average, a larger number of school-aged children. This is particularly true for elementary school yield. The explanation is obvious, at least for urban North America. Elementary schools are sited by neighbourhood. There is a tradition of children *walking* to school. Many school jurisdictions offer no meal service so the children return home for lunch, i.e., they walk to or from school four times per day.

Demographic and Socio-economic Factors

Population, age structure, fertility and migration. It is obvious that the age structure of the current population in a community defines the size of the client group for the schools. It is also obvious that fertility rates have a direct bearing on the number of children the community will have in the future. Young parents are having smaller (total) families than parents of older generations (i.e., ones who are now middle aged). On the other hand old parents are likely to have few children still at home who are of school attendance age. If

the majority of the parents of a district are young, it is safe to conclude that (barring migration) housing yields will increase for a period of years. The reverse holds true when the majority of parents in a district are middle aged.

Apart from fertility factors, size of family is also sensitive to religion and differences in ethnic origin. Such groupings reflect differences of value system, particularly differences in the value placed on having children. Therefore, in certain communities, the religious, ethnic and linguistic composition of the population may have important implications for housing yields.

Economic Variables

It is exceedingly difficult to decide not only which economic variables are of importance to the pupils-to-housing ratio but also how they act. A simple notion of costs and income would have one argue as follows: maintaining dependents is expensive, children studying full time are dependent (whatever the level of study), therefore the larger the family income the larger the number of children studying full-time. This holds true, for example, if we are considering university or post secondary study. But it is not true, in general, that family size is positively related to family income. Low income families have larger numbers of children and the highest pupil yields are always from low income families in publicly assisted rental housing. Even for owner-occupied single family houses, the higher the assessment value, on the whole, the lower the yield ratios.

In summary, let us list the demographic and economic variables which should be considered:

- age structure of the population, particularly the age of parents,
- fertility trends, birth rates, particularly age-specific rates,
- migration of families,
- religion,
- ethnic groupings and
- family income

For any one actual set of estimates only a limited number of variables may be used but in many school districts of North America good time series of such data are available. Our main problems are conceptual—we do not know which are the best classifications and cross classifications to use to obtain good forecasts (and why), and we do not understand the causal relationship between the network of interacting variables and family size, and family size and housing yield of pupils.

Our experience and that of many school planners attests to the need for an enrollment forecasting method which will produce a reasonably accurate middle and long range (5 and 10 year) estimate for a small area, even a single school building. The housing yield ratio is the most promising but it needs considerable refinement. In a contracting system such forecasts are needed to identify which school buildings will become redundant in the near future, sufficiently early for communities to take remedial action. In the 60s we were estimating housing yield in order to demonstrate the *need for schools*. In the late 70s we may well be predicting enrollment in order to demonstrate the *need for a changed use or type of housing stocks*. New school plant in many neighbourhoods represents a public investment of millions of dollars. One way of addressing the problem of emptying schools is to arrange for shared use with other community agencies. This has been a rapid

development in recent years but it is not without headaches for the administrators of schools. Another way of solving the problem would be to ensure, in the aging housing stocks and turnover of users, that some high yield users are introduced into the community.

In any case, at OISE we are convinced that the most promising line of development for this method is not to search for a single reliable housing indicator but to try a component forecasting method based on three sets of causal relationships. We shall end this note with a description of a method currently being attempted with the cooperation of the Etobicoke Board of Education.

A Framework for Estimating School Enrollment by Use of Housing Yield Ratios

Since 1967 the Etobicoke Board, which is responsible for the public elementary and secondary school system of that borough, has been collecting data on pupil and housing populations. Their planners have successfully used these data to make very accurate yearly forecasts of student enrollment, by school, for use in budget preparation, but their emphasis is on one-year-forward accuracy. We are more interested in 5- and 10-year accuracy. Here we shall describe the theoretical framework for using these data to make such estimates. The forecasts have not been completed so, in a later note we shall report on the range of our error.

We have argued that the pupils-to-homes factor is a function of three sets of variables: Housing characteristics (H), demographic characteristics (D) and socio-economic variables (S). Under the assumption that the implicit relationship is linear, we may express the relationship symbolically as:

$$a_{it} = \alpha_{0t} + \alpha_{ht} H_{it} + \alpha_{dt} D_{it} + \alpha_{st} S_{it} \quad \begin{matrix} i = 1, 2, \dots, G \\ t = 1, 2, \dots, T \end{matrix} \quad (6)$$

Where a_{it} and α_{0t} are scalars and α_{ht} , α_{dt} , α_{st} , H_{it} , D_{it} and S_{it} are vectors of appropriate orders. N denotes the total number of dwelling units and T stands for the number of years for which data are available. The subscript t has been added to admit the possibility that the causal relationship (equation (6)) may change over time, in terms of the estimated parameters α_o , α_h , α_d and α_s .

As expressed, relationship (6) is directly estimable only by the technique of random coefficients' estimation. But this technique is involved and costly, and not advisable when the main purpose of the exercise is to forecast the yield rather than exactly estimate the causal relationship. Moreover, data on variables comprising the sets D and S are not available for the jurisdiction of Etobicoke. Therefore we have adopted an estimation and forecasting procedure which, though heuristic, captures the spirit of relationship (6).

Step 1: For each year, ($t=1, 2, \dots, T$), for which statistics on housing characteristics are available, we estimate the following relation using the multiple regression technique:

$$a_i = \alpha_o + \alpha_h H_i \quad (7)$$

Let $\hat{\alpha}_o(t)$, $\hat{\alpha}_h(t)$, ($t = 1, 2, \dots, T$) represent the estimated parameters for the T years.

Cicely Watson

Step 2: Hand draw on graph paper, or statistically fit, an appropriate trend curve through each set (over time) of estimated parameters. Let $\hat{\alpha}_o(T+r)$, and $\hat{\alpha}_h(T+r)$ and $(r = 1, 2, \dots)$ denote the values of the parameters obtained by extrapolating the trend to the year $T + r$.

After steps (1) and (2) have been completed, the forecast value of a_{it} may be written as:

$$\hat{a}_{iT+r} = \hat{\alpha}_o(T+r) + \hat{\alpha}_h(T+r) H_{iT+r} \quad r = 1, 2, \dots \quad (8)$$

In actual practice, a pure time trend in the coefficients may not prove an adequate representative of the variability over time. In such a case, provided the data are available, the alternative step 2 shall be performed.

Alternative Step 2: If data on any of the variables in categories D and S are available, we estimate the following set of relationships once again, using multiple regression technique.

$$\begin{aligned} \hat{\alpha}_{ot} &= \beta_o + \beta_1(D_t, S_t) \\ \hat{\alpha}_{ht} &= \alpha_o + \alpha_1(D_t, S_t) \end{aligned} \quad (9)$$

Where β_o and α_o are scalars and β_1 and α_1 are parameter vectors of the appropriate order. Let $\hat{\alpha}_{dT+r}(\hat{D}_{T+r}, \hat{S}_{T+r})$ and $\hat{\alpha}_{hT+r}(D_{T+r}, S_{T+r})$ stand for the coefficients obtained by projecting the estimated relationship (9) to period $T+r$. When alternative step 2 is followed the forecasting equation becomes:

$$\hat{a}_{iT+r} = \hat{\alpha}_{oT+r}(D_{T+r}, S_{T+r}) + \hat{\alpha}_{hT+r}(D_{T+r}, S_{T+r}) \cdot (H_{iT+r}) \quad (10)$$

It is obvious that forecasting equation (10) is closer, in spirit, to the basic relation (6) than forecasting equation (8) is. Equation (10) has the advantage of taking into account the effects of the demographic and socio-economic factors which could not be directly introduced because of data limitations.

Once the housing yield factors have been estimated, either by equation (8) or (10), they will be combined with the estimated number of dwelling units in the manner of equations (1) or (2) to obtain the forecast enrollment.

To apply the described steps to the data of Etobicoke Board, no essential modifications are required. The Board has a time series of housing statistics by type of dwelling unit (single family housing, apartments and maisonettes), type of ownership (conventional, condominium, Ontario Housing Corporation and limited dividend), date of construction, height of building, and number of bedrooms. The vector H in Equation (8) will, therefore, include 9 variables—5 dummies for the two qualitative variables and 3 for the quantitative variables. Thus the specification of equation (7), written in full for the case of Etobicoke, would be:

$$a_i = \alpha_o + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \alpha_3 X_{3i} + \sum_{k=1}^1 \alpha_{3+k} Y_k + \sum_{l=1}^3 \alpha_{5+l} Z_l \quad (11)$$

where X_1 = number of bedrooms
 X_2 = age of building
 X_3 = height of building (number of storeys)

- $Y_1 = 1$ if dwelling is an apartment
0 otherwise
- $Y_2 = 1$ if dwelling unit is a maisonette
0 otherwise
- $Z_1 = 1$ if the ownership category is conventional
0 otherwise
- $Z_2 = 1$ if the ownership category is condominium
0 otherwise
- $Z_3 = 1$ if the ownership category is Ontario Housing
0 otherwise

If trend analysis of the coefficient does not generate satisfactory results, we shall have to use equation (9). The counterpart of relation (9) for the Etobicoke analysis would be a set of eight relations, one each for the eight coefficients. The only data of categories D and S which we have readily available are birth rates, live births and average family income. Only one of the two demographic variables will be used to avoid the possibility of multicollinearity. In this situation the counterpart of equation (9) may be expressed as:

$$\hat{\alpha}_j(t) = \beta_0 + \beta_1 L_{t-k} + \beta_2 I_t \tag{12}$$

where L_t = Live Births appropriately lagged, and I_t = average family income of the community.

Conclusion

The method of calculating for a school or small area (neighbourhood or district) enrollment estimates on a ratio of pupil yield from housing is one which is commonly used by school administrators in North America. For the most part it is used to obtain figures for one-year-forward budget estimates. In the 1960s when suburbs were proliferating on the edge of our urban centres there was a flurry of interest in developing the method for longer term forecasting, but in recent years it has been neglected because local school planners are faced with problems of system contraction rather than system expansion. This paper outlines the assumptions of the method and describes the framework of current work at OISE which has the purpose of trying to improve it and extend its use.

TABLE 1 ELEMENTARY SCHOOL PUPIL-YIELD RATIOS
(Pupils per dwelling unit)

	Number of Bedrooms				Weighted Average of all Units
	1	2	3	4	
SINGLE DETACHED DWELLINGS	—	.430	1.047	1.377	.982
By school enrollment area:					
1	—	.760	.761	*	.737
2	—	*	.952	1.522	1.126
3	—	*	1.000	*	1.162
4	—	*	1.403	1.154	1.303
Lakeshore	—	.255	1.103	*	.656
APARTMENTS ¹	.030	.313	.418	*	.226
By age of building:					
6 years old or more	.045	.371	*	—	.226
5 years old or less	.018	.284	.418	*	.226
Among the latter, by size:					
60 suites or less	.026	.440	.653	*	.340
61 suites or more	.012	.208	.328	*	.170

TABLE 2 SECONDARY SCHOOL STUDENT-YIELD RATIOS
(Students per dwelling units)

	Number of Bedrooms				Weighted Average of all Units
	1	2	3	4	
SINGLE DETACHED DWELLINGS	—	.222	.314	.633	.325
By school enrollment area:					
1	—	.120	.403	*	.313
2	—	*	.177	.566	.263
3	—	*	.286	1.375	.405
4	—	*	.402	.462	.405
Lakeshore	—	.277	.256	*	.260
APARTMENTS ¹	.005	.055	.376	*	.069
By age of building:					
6 years old or more	.009	.068	*	—	.041
5 years old or less	*	.048	.377	*	.084
Among the latter, by size:					
60 suites or less	*	.055	.320	*	.076
61 suites or more	*	.045	.399	*	.087

*Frequency in class not statistically significant.

¹Does not include the Lakeshore.

Source: Murray V. Jones, *op. cit.*

EDUCATIONAL PLANNING

TABLE 3 YIELD OF CHILDREN PER UNIT BY TYPE AND AGE OF BUILDING

Building Type	Building Age (in years)			All ages
	0 - 3	4 - 7	8 - over	
Single Family	2.10	1.87	1.27	1.82
Townhouse	2.18	1.78	No Units	1.95
Apartment	0.49	1.06	1.21	0.97
All Units	1.61	1.76	1.24	-

Source: Gibbs, *op. cit.*, Tables VI and XII.

TABLE 4 YIELD OF CHILDREN PER UNIT BY VALUE OF UNIT

Unit Value	Age of Children (in years)					Total
	0 - 4	5 - 8	9 - 12	13 - 16	17 - 21	
low (under \$6400)	0.34	0.31	0.24	0.21	0.18	1.28
high (over \$6400)	0.26	0.41	0.45	0.45	0.32	1.84

Source: Gibbs, *op. cit.*, Table X.

TABLE 5 PUPIL YIELD OF SINGLE FAMILY DWELLINGS BY ASSESSED VALUE AND NUMBER OF BEDROOMS OF UNIT

Assessed Valuation of Dwelling Unit	Number of Bedrooms									
	Total Units	2				3				
		Pre.	Ele.	Jr.	Sr.	Total Units	Pre.	Ele.	Jr.	Sr.
Less than \$2000	46	.370	.522	.109	.065	36	.194	.694	.306	.028
\$2000 - 4999	175	.366	.206	.057	.097	236	.309	.462	.246	.144
\$5000 - 7999	535	.331	.357	.084	.082	1097	.406	.497	.180	.127
\$8000 - 10999	504	.246	.194	.069	.071	1766	.446	.470	.152	.100
\$11000 - 13999	112	.259	.188	.018	.036	700	.349	.437	.181	.157
\$14000 - 16999	35	.257	.143	.029	.086	206	.350	.471	.204	.131
\$17000 - 19999	16	.188	-	.063	.063	71	.155	.310	.169	.169
\$20000	12	.083	.083	-	-	48	.104	.396	.188	.167
	1435	.295	.262	.069	.075	4160	.395	.469	.174	.122
					(.702)					(1.161)

Source: Ellene *et al.*, *op. cit.*, Table II.

TABLE 6 STUDENT YIELDS (GRADES K - 12) PER HOUSING UNIT, BY HOUSING TYPE

	Bloomingtondale, N.J.	Fairfax Cnty., Va.	Falls Church, Va.	Montgomery Cnty. Va.	Nassau Cnty., N.Y.	North York Twp. Ont.	Philadelphia, Pa. (Suburban)	Skokie, Ill.	Stamford, Conn.	Mean No. Students per Housing Unit
Single-Family										
Detached	-	1.08	0.71	1.30	-	-	0.50	1.10 ¹	-	0.94
Duplex	-	1.08	-	1.30	-	-	-	-	-	1.19
Townhouse	-	0.65	-	1.00	-	-	-	-	-	0.82
Mobile Homes	-	0.37	-	-	-	-	-	-	-	0.37
Garden Apts.	0.21	0.21	0.47	0.47 ²	0.24	-	0.22	-	-	0.30
H-R Apts. (elevator apts.)	-	0.09	0.06	0.09 ³	-	0.16	0.02 ⁴	-	0.13	0.08
General Multi-Family (all apts.)	-	-	-	-	0.19	-	-	0.42	-	0.30

¹ Figure is for 6.66 housing units per acre; higher density single-family (9.16 housing units per acre) had 0.66 students per housing unit.

² Figure is for 21.3 housing units per acre; lower density garden apartments (14.2 housing units per acre) had 0.60 students per acre.

³ A 0.35 figure is also listed for the same density (42.50 housing units per acre). The figure is applicable to a different zoning district.

⁴ High-rent apartments only.

TABLE 7 YIELDS OF CHILDREN AGE 0 TO 18 PER UNIT BY APARTMENT SIZE, IN SELECTED COMMUNITIES

	Children per Unit		
	Number of Bedrooms		
	1	2	3
Montgomery County, Maryland American Elevator Apartments	0.01	0.26	0.89
North York Twp., Ontario "Conventional"	0.07	0.55	1.17
North York Twp., Ontario "Limited Dividend"	0.34	1.40	2.32
Chicago Housing Authority	0.75	2.25	4.21

Source: Holley, *op. cit.*, Tables 4 and 6.

REFERENCES

1. W.J. Ellene, L.W. Joos and J.C. McLaulin, "Predicting Pupil Yield by Types of Dwelling Units", Washington, D.C.: U.S.O.E. 1962 (Mimeograph). At the time of publication Mr. Ellene was Assistant Executive Secretary of the American Association of School Administrators, N.E.A.; Mr. Joos, Director of Research of the Baltimore County Public School System; and Mr. McLaulin a Research Assistant with that Board.
2. Murray V. Jones *et al*, Consultant's Report prepared for the Etobicoke Board of Education, 1966. (unpublished)
3. Paul Holley, "School Enrollment by Housing Type", Report No. 210. ASPO Planning Advisory Service May 1966, American Society of Planning Officials, Chicago, Illinois. (Mimeograph)
4. Douglas D. Andress, "The Impact of Apartment Building and Townhouse Development on School Planning, London, Ontario". M.A. thesis, University of Western Ontario, 1967. Available on microfilm.
5. W.F. Gibbs, "Development of a System for Predicting School Enrollment Using Selected Housing Factors", Northwestern University, 1966. Unpublished doctoral dissertation available from University Microfilms Inc., Ann Arbor, Michigan, Ref. 67-4224.
6. Referred to in Holley, *op. cit.*

ECONOMIES OF SCALE IN THE OPERATION OF PUBLIC ELEMENTARY SCHOOLS

Introduction

In recent years public school enrollments have declined steadily. This is a trend which is expected to continue well into the future. Although the decline in enrollments eventually will affect all levels of public education, it is the elementary school which has been affected first. In certain school districts there is no viable alternative to closing schools. In such situations the difficult choice must be made as to which among several elementary schools will have to be closed. A related decision will also involve the redistribution of students among the remaining schools within the district.

Criteria for these decisions undoubtedly vary with school districts and are constrained by political and organizational considerations. However much the economic factors may be merely contributing ones in the decision criteria, they cannot be ignored. Information on the relationship between per-pupil operating costs and elementary school size have important implications for school closures. In most jurisdictions very little is known about the relationship between elementary school size and per-pupil operating cost. This paper will examine this relationship through the estimation of a long-run average cost function for selected public elementary schools. Once the long-run average cost function has been estimated, it can be used as an indicator of the minimum per-pupil operating costs associated with various levels of educational output. For this exercise we assume that the administrator will be free to vary the size of the elementary school facility. It will also indicate the optimum sized elementary school (if one exists). Such information on economies of scale should be part of the package of relevant information available to planners and administrators.

The Approach

In attempting to empirically estimate a long-run cost function, the first problem one encounters is in the relationship between the short-run and the long-run. As Ferguson¹ points out, virtually all economic activity takes place in the short-run (where there are one or more fixed inputs). Thus, except by chance, a firm is seldom found operating on the long-run total cost function; rather, it is found operating on a short-run total cost function. The reason for this is that the organization in the short-run is unable to adjust all of its factors of production to the optimum level for the quantity of output it is given to produce.² Therefore, the problem becomes one of empirically estimating theoretically postulated long-run relationships and phenomena, from data that reflect short-run behaviour.

This problem can be overcome by making use of the tangential relationship between the long-run cost function and the associated family of short-run cost functions. As Henderson and Quandt³ noted, the long-run cost curve is not something apart from the

* Assistant Professor, Pennsylvania State University.

** Assistant Principal, Big Springs School District, Newville, Pennsylvania.

short-run curves. It is constructed from points on the short-run curves. Consider a production function,

$$Y = f(X_1, X_2, \dots, X_n) \quad (1)$$

where Y represents output and X_1, X_2, \dots, X_n represent various inputs and X_n the fixed input. The short-run cost function obtained from equation (1) under the assumption of cost minimization and exogenous prices can be written as:

$$C = \phi(Y, P_1, \dots, P_{n-1}, X_n) + P_n X_n \quad (2)$$

where P_1, \dots, P_n are input prices. The above equation states that short-run total costs are the sum of short-run variable and fixed costs. Writing equation (2) representing the family of short-run cost functions in implicit form we obtain:

$$\begin{aligned} C - \phi(Y, P_1, \dots, P_{n-1}) - P_n X_n \\ = G(Y, P_1, \dots, P_n, X_n) = 0 \end{aligned} \quad (3)$$

The condition existing at each point of tangency between a short-run cost function and the long-run cost function is given by:

$$\frac{\partial G}{\partial X_n} = 0 \quad (4)$$

Thus, solving (4) and substituting the result into (3) we obtain the long-run cost function:

$$C = L(Y, P_1, \dots, P_{n-1}) \quad (5)$$

where long-run cost becomes solely a function of educational output levels and the given price of the inputs.

The above discussion suggests an indirect method of estimating the parameters of the unobservable long-run cost function. One can estimate the parameters of the family of short-run cost functions and then make use of this relationship between the short-run cost functions and the long-run cost function to obtain the parameters of the long-run cost function. This is the procedure we employ in this study. One of its added advantages is that it minimizes the potential bias that might result from the estimation of a long-run cost function from a scatter of points generated by observations on a family of short-run cost functions.

Educational output. The problem of accurately defining educational output has probably been the single most important reason why economists have consistently avoided examining scale effects in public education within the appropriate theoretical framework (i.e., the long-run cost function). Public education produces several outputs. Boulding,⁴ for example, identified five products of the schooling industry: knowledge, skills, custodial service, certification and community action. Not only is there the problem of accurately weighting and quantifying these and other outputs across school districts and schools, but even of knowing with certainty what the schools are actually producing. Hills put it succinctly:

We do not know what the functions of education are. Although there are volumes upon volumes of ideological exhortations and prescriptions concerning what the functions of education should be, there is relatively little in the way of

concrete knowledge concerning the actual, objective consequences of existing educational activity. That is to say, we have a great deal of information regarding the subjective dispositions—aims, motives, and purposes—attributed to education, but we know little enough about what schools actually do, and practically nothing about the objective consequences of these activities for the larger structures in which the schools are involved.⁵

A reasonable approach to this difficult problem is to look for a “corner solution”, a kind of empirical second best. Given that we are unable to specify accurately and quantify the various outcomes of public education, we might at least begin thinking in terms of levels of educational services and some variable which would reflect differing levels of educational services. The critical distinction to be made here is between that which approximates levels of educational services and the services themselves. Such a variable, albeit a somewhat crude reflection of service, is average daily membership (ADM). In this paper it is used as a proxy of the level of service an elementary school is given to produce.

There are a number of advantages to this approach: program variation across elementary schools is not substantial. The use of ADM as a proxy reflecting levels of educational services is not only more realistic but also less restrictive and biased than the use of achievement test scores or similar measures. In making ADM a proxy for level of educational services provided, we are simply stating that as ADM increases so do the sum total of pupil educational experiences and resulting services provided by the educational organization. Specifically, ADM varies directly with the level of services of an elementary school. Another advantage of using ADM is that it includes learning experiences beyond merely the cognitive types. There is also a statistical advantage. ADM is relatively stable and predictable over the academic year, and this reduces potential bias in the estimation of the long-run cost function.⁶ One final consideration suggesting that the use of ADM is acceptable: in certain instances, state departments of education, and school administrators and planners use ADM as an output proxy in making certain types of decisions. That is, they make the assumption that some minimal level of “learning” is occurring when any service is provided.

Additional methodological considerations. One recurring criticism of cost studies in education is the *a priori* assumption of a U-shaped average cost curve. Generally no attempt is made to test statistically the extent of departure from linearity.⁷ To avoid the possibility of mis-specifying the functional form of the cost-ADM relationship, both a linear and curvilinear total cost function will be estimated. Then the function which best fits the data will be selected and used to estimate the long-run average cost function for the sampled population.

Finally, we must be concerned with minimizing wide differences in school quality, if the findings are to be meaningful. One procedure frequently used is the construction of a school or district “quality index”, composed of various school inputs, and “controlling” for school quality by introducing it into the cost equation or analysis. This procedure has been employed when examining public school expenditures and the scale effects in public education. However it assumes, *a priori*, that the different inputs used in the various indices relate to, and measure, school quality. Typical input variables assumed to reflect school quality include:

- pupil-teacher ratio
- per-pupil expenditures

- the number of books in the school library
- the number of school credit units offered
- percentage of teachers with master's degrees
- average teacher salary
- percentage of teachers qualified to teach in two or more fields.

But there is little empirical support for this procedure. Raymond examining the relationship between selected input variables and elementary and secondary school quality in West Virginia concluded:

Empirical results pertaining to the state of West Virginia give no support to the use of certain input variables as proxies for the quality of education. There was no evidence of a significant relationship between quality and student-teacher ratio, the percent of teachers in two or more fields, current expenditures, or the adequacy of library facilities. Thus, in spite of obvious and perhaps convincing arguments in support of these factors, it appears that, in fact, they are not always accurate indicators of quality.⁸

These 1968 findings are consistent with those of more recent studies by Hanushek and Levin.⁹

Raymond did find, however, that salary variables seemed to be related to school quality but warned against their indiscriminant use as a proxy. Following to some extent these findings, we excluded from the population all elementary schools whose mean teacher salary was \$8,000 or less. It was felt this procedure would reduce large variations in quality between schools. To further minimize qualitative differences among schools, a second procedure was employed which had originally been used by Riew¹⁰ to minimize qualitative differences among high schools. Only schools accredited by the North Central Association of Colleges and Secondary Schools, as of 1973-74, were included in the population. There are 503 school districts in Pennsylvania containing 1404 elementary schools. Establishing a minimum mean teacher salary and including only those schools which were North Centrally accredited reduced the population to 1,216. While all qualitative differences among sampled schools were not eliminated by these two procedures, it was felt that enough variance in school quality had been eliminated to make estimation of a long-run average cost function and discussion of economies of scale meaningful for the remaining elementary schools in the study.

The Data. Data on ADM and current operating costs were collected for the 1973-74 fiscal year from forty-two Pennsylvania public elementary schools (grades kindergarten through six). They ranged from 136 students to 866 in average daily membership; with the actual range of the school population from 135 pupils to 1,324 pupils in ADM. That is, the sampled range does not include the highest or lowest elementary school ADM levels found in the state, but it does include 1,204 (or over 99%) of the 1,216 elementary schools in the population.

A total short-run operating cost was obtained for each elementary school in the sample. The figure represents operating expenditure on administrative, teacher, instructional, operation and maintenance inputs, and accounts for approximately 97% (or more) of a school's current operating costs. The remaining 3% include expenditures on such things as auxiliary services (health programs, school lunches and other items), transportation costs (which were impossible to calculate accurately on a per school basis), bonded indebtedness and depreciation costs.

The total square footage of the elementary school was used to represent the scale variable that must be included in the estimation of the short-run total cost function. External school facilities (such as the playground and track, etc.) were not included.

In summary: from a population of 1,204 elementary schools a sample of forty-two observations was obtained. The sample was purposive in two ways: (1) data were obtained so as to maximize the range of observations on ADM, and (2) because Pennsylvania has relatively few elementary schools whose ADM exceeds 900 pupils (excluding Pittsburgh and Philadelphia), an attempt was made to obtain the largest possible number of observations below this ADM level. Finally, the sample was reduced by two observations to minimize the potential bias resulting from the "regression fallacy".

Analysis and Findings. To estimate the various cost functions, the procedure of ordinary least squares was employed. This estimation procedure is most appropriate where: (1) deviations between planned output and actual output are small, (2) cross sectional data are employed, and (3) the organization is primarily concerned with cost minimization for given levels of output. These conditions are consistent with the Pennsylvania elementary school operation and the data.

Ultimately we are concerned with the shape of the long-run average cost curve (LRAC) which indicates the nature and extent of scale effects. The shape of any curve is dictated by the particular mathematical function specified, so the question becomes: what is the functional form which best fits or describes the data? This is not an easy question to answer. As Klein points out, "Frequently in econometric research more than one hypothesis is consistent with a given sample of data...and non-linear cost functions may sometimes fit a given sample of data as well as a linear function".¹¹

Because the form of the function is crucial, the following method was employed to avoid possible mis-specification. First: a linear total cost function was estimated where cost (Y) was specified as a function of ADM (X). Then, second and third order terms in ADM (X_1^2 and X_1^3) were added and retained in the regression equation only if their coefficients proved to be, on application of the "t" test, significantly different from zero at the one percent level. That is, we only entertained the possibility of a curvilinear total cost function if both the higher order terms differed significantly from zero at the .01 level. Usually a measure of goodness of fit is given by the R^2 value. However, because both linear and non-linear functions may give a good fit to the same data, the above procedure in addition to examination of R^2 's was employed. Also the change in the mean square error was examined upon introduction of the higher order terms.

Statistical results. Total cost functions of the following general form were estimated:

$$Y = \hat{b}_1 X_1 + \hat{b}_0 + u \quad (6)$$

$$Y = \hat{b}_3 X_1^3 + \hat{b}_2 X_1^2 + \hat{b}_1 X_1 + \hat{b}_0 + u \quad (7)$$

where X_1 equals ADM, Y equals total operating cost and u equals the disturbance term. Both total cost functions were forced through the origin. The results are given in Table 1 below. When the additional higher terms are introduced into the equation, suggesting a curvilinear relationship between total cost and ADM, not only is the mean square reduced by a significant extent but both regression coefficients of the higher order terms are significantly different from zero at the .01 level. Also a modest increase in the R^2 value

TABLE 1 RESULTS AND COMPARISON OF EQUATIONS (6) AND (7)

Equation Number	Y	$\hat{b}_1 X_1$	$\hat{b}_2 X_2^2$	$\hat{b}_3 X_3^3$	R ^{2*}	F Value	Mean Square	Mean Square of Residual
(6)	Y =	790.28**			.841	3447.24	656.70	.1905
(7)	Y =	1406.9**	- 2.1650**	.0017924**	.895	1746.62	219.90	.1259

Y = total current operating cost
 X = average daily membership
 * = adjusted for degrees of freedom
 ** = regression coefficient is significant at the .01 level

occurred (however, this means little here because we are concerned with the shape of the total cost function, in particular, its departure from linearity which is suggested by the significant regression coefficients of the higher order terms). It does appear, then, that the total cost function is curvilinear and equation (7) was selected as best describing the functional relationship between total operating cost and ADM.

Consistent with the methodology previously set out, scale was explicitly introduced into the total cost function estimated above. As noted earlier, the variable chosen to represent elementary school size was total square footage of the elementary school. Five short-run total cost functions, each specifying a different size, ADM, and cost relationship, were estimated. The rationale for this rather shot gun approach lies in the complexity of second and third order models which yield "surfaces". As Draper and Smith indicate with regard to second and third order models: "Omission of terms implies possession of definite knowledge that certain types of surface (those which cannot be represented without the omitted terms) cannot possibly occur. Knowledge of this sort is not often available. When it is, it would usually enable a more theoretically based study to be made."¹²

Of the five equations specified and estimated, the following general form was finally selected:

$$Y = \hat{b}_3 X_1^3 + \hat{b}_2 X_1^2 + \hat{b}X_1 + \hat{c}_1 X_1 X_2 + \hat{c}_2 X_2^2 + u \tag{8}$$

where Y equals total operating cost, X₁ equals ADM, and X₂ equals the total square feet of the elementary school facility.

Estimation of the above generalized form resulted in the following specific short-run total cost function for selected elementary schools in Pennsylvania:

$$SRTC = 1457.9 X_1 - 3.1295 X_1^2 + .001989 X_1^3 + .013038 X_1 X_2 - .000053154 X_2^2$$

$$R^2 = .90. \tag{9}$$

Again, the regression coefficients of ADM were significant at the .01 level. The total F of the equation was 1746.62. Also, inclusion of the scale terms reduced the mean square error from 219.90 to 132.0.

Following the procedures described earlier, the long-run total cost function for selected public elementary schools in Pennsylvania was obtained:

$$\text{LRTC}_a = 1457.9X_1 - 2.34004X_1^2 + .001989X_1^3, \quad (10)$$

and dividing the above function through by X_1 gives the long-run average cost function:

$$\text{LRAC}_a = 1457.9 - 2.34004X_1 + .001989X_1^2. \quad (11)$$

Given the long-run average cost function, is there some optimum ADM level? The question mathematically is whether or not the LRAC function estimated above has a minimum value. The function was found to satisfy both the necessary and sufficient conditions for a minimum value. Specifically, the minimum point on the long-run average cost function occurs where ADM is 585.7 pupils.

To determine the optimum elementary school size, which gives the tangency of both the short-run and long-run cost curves at their minimum points, we must return to the short-run total cost function. The optimum elementary school size for the ADM level of 585.7 pupils was found to be 71,832 square feet. At this point the short-run and long-run cost curves are tangent at the minimum points of both, and the long-run average cost or cost per pupil in ADM is minimum.

This suggests that considerable economies of scale might well be realized in the operation of Pennsylvania elementary schools up to the optimum ADM level. For example, the long-run average cost function suggests that an increase in ADM from 100 to 300 students would result in a saving of \$308.88 in per-pupil operating expenditures, *ceteris paribus*. With an increase in ADM from 200 students to 400 students, a saving of \$229.32 per pupil could be expected. And for an increase in students from 300 to 585.7 in ADM, the expected saving would be \$165.22 per pupil.

Of course, such figures are only approximations and they must be interpreted and used with caution. However, if there are policy decisions involving the image of some "average" or "typical" school, the procedures employed here enable reasonable estimates to be produced.

Conclusions

In this paper we have demonstrated how a long-run average cost function was estimated for selected public elementary schools in Pennsylvania. The optimum sized elementary school was found to be one having 585.7 students in ADM and an educational plant of 71,832 square feet, and substantial economies of scale were evidenced up to the optimum ADM level. In conducting our study an attempt was made to stay within the constructs and hypotheses suggested by existing economic theory, with slight modification. The findings support the traditionally maintained hypothesis of a U-shaped long-run average cost curve found in economic cost theory.

By these procedures new and potentially useful information can be obtained by explicitly introducing total square footage of the elementary school facility into the

short-run cost function as the fixed factor. This will allow educational planners and administrators to determine for each level of educational services which a school is given to produce, an associated facility size that will place the school on its long-run cost function.

As far as we can learn, this is the first study of its kind at the elementary school level. Before generally adopting these procedures comparable exercises for different populations should be undertaken. It will be noted that our study avoided the large elementary schools found in urban areas. Significantly different findings might result in a study of urban elementary schools, *per se*, and we do not suggest that estimates of this type are necessarily useful in determining which schools might be closed in an urban system experiencing severe contraction.

It is interesting to note that scale studies of secondary schools have been remarkably consistent, even though different methodologies and populations have been used. Such studies place the optimum high school ADM at between 1,200 and 1,500 pupils, with the majority of the studies placing the number at approximately 1,500.

The findings of this study and similar studies should be used by planners in addressing policy questions about the number, size and location of the elementary schools of their districts. This is not to suggest that they use such estimates alone. Nor do we intend to imply that they be given an important weight in relation to other political and social data. We merely suggest that criteria such as the optimum size of a school cannot be ignored and the procedures for estimating economies of scale will not be improved unless estimations are systematically produced and used.

REFERENCES

1. C.E. Ferguson, *Microeconomic Theory*. Homewood, Illinois: Richard D. Irwin, 1966, p. 108.
2. G. Eads, *et al.*, "A Long-Run Cost Function for the Local Service Airline Industry: An Experiment in Non-Linear Estimation", *Review of Economics and Statistics*, Vol. 51, No. 3, August, 1969, p. 259.
3. J. Henderson and R. Quandt, *Microeconomic Theory: A Mathematical Approach*. New York: McGraw Hill, 1958, pp. 58-60.
4. Kenneth E. Boulding, "The Schooling Industry as a Possibly Pathological Section of the American Economy", *Review of Educational Research*, Vol. 42, No. 1, Winter, 1972, pp. 130-134.
5. J. Hills, "The Function of Research for Educational Administration", *Journal of Educational Administration*, Vol. 5, 1967, pp. 11-12.
6. J. Johnston, *Statistical Cost Analysis*. New York: McGraw Hill, 1960, pp. 26-27.
7. C. Sabulao and G. Hickrod, "Optimum Size of School District Relative to Selected Costs", *Journal of Educational Administration*, October, 1971, p. 180.
8. R. Raymond, "Determinants of the Quality of Primary and Secondary Education in West Virginia", *Journal of Human Resources*, 1968, p. 469.
9. See E. Hanushek, "Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro Data", *American Economic Review*, Vol. LXI, May, 1971, pp. 280-288; and H. Levin, "Measuring Efficiency in Educational Production", *Public Finance Quarterly*, January, 1974.
10. J. Riew, "Economies of Scale in High School Operations", *Review of Economics and Statistics*, August, 1966, pp. 280-287.
11. L. Klein, *An Introduction to Econometrics*. New Jersey: Prentice Hall, 1962, p. 121.
12. N. Draper and H. Smith, *Applied Regression Analysis*. New York: John Wiley & Sons, Inc., 1966, p. 130.

EDUCATIONAL PLANNING FROM TAXONOMIC TO TRANSFORMATIVE

Introduction

Wildavsky's¹ much-quoted observation, "if planning is everything maybe it's nothing", presents a grave challenge to planners. In fact, a number of them are thinking along the same lines. Rittel and Webber's² distinction between "wicked" and "tame" problems provides one explanation of shortcomings in social planning through deepening insight into its unique characteristics. Similarly, Maruyama³ stresses that unwillingness or inability to apply different kinds of logic, derived from different planning paradigms, impedes solution of social problems and increases planning failures. And Krieger,⁴ exploring new directions for planning theories, provides yet another reaction to the unsatisfactory condition of planning theory.

Wildavsky's analysis distinguishes between planning as future control, as cause, as power, as a process of adaptation, as intention and as rationality, and exposes the ambiguity of the term *planning*. Too often the concept stands for different processes. Moreover since it is conceived differently by different people, planning almost by definition seems bound to fail through lack of consensus. Therefore, any meaningful theory of educational planning will have to account of this fundamental ambiguity of the term.

Following Dror, Anderson and Bowman, and Adams and Bjock, defined educational planning as "the process of preparing a set of decisions for future action pertaining to education". The notion of change is not explicit in such a definition but the present paper starts from a similar position: it will consider educational planning as a process oriented to future change of present situations. In the words of Diez-Hochleitner, "planning is an attitude reflecting the desire for orderly change and the strategy by which this change can be brought about".⁵

Planning as a message for change

Viewing educational planning as a process of communicating, deepens insight into several of its implications and ambiguities. According to Simon, "the question to be asked of any administrative process is: how does it influence the decision of... individuals? Without communication, the answer must always be: it does not influence [them] at all".⁶ In line with Guetzkow's "Communication in Organization", we shall define the process of communication as an interchange of meanings through shared symbols. Then planning will be seen as a message stating the process of change, and plans are the message's formal utterance. All too often, however, we limit our analysis to the formal and explicit aspects of the planning process. But as Chomsky has pointed out a message, considered as a linguistic symbol, has both a surface and a deep structure.⁷ And, following Merton,⁸ our analysis can distinguish between the manifest and latent functions of the planning process.

*Professor, School of Education, Hebrew University of Jerusalem.

Merton distinguished between manifest and latent functions in order to avoid confusion between the motivation for social behaviour and its objective consequences. Chomsky, in his linguistic theories, emphasized that grammar can be regarded as a device for pairing phonetically represented signals (the surface structure) with semantic interpretations (the deep structure, which has a decisive role in determining meaning) and noted that, "in general, apart from the simplest examples, the surface structures of sentences are very different from their deep structure". He attempts to close the gap between the formalized symbols of a message and its semantic interpretations, and thereby clarify its ambiguity. From this viewpoint Merton's distinction between latent and manifest functions acquires a new linguistic interpretation complementary to the usual sociological interpretation.

Given such a framework, the surface structure of a plan may be defined as the set of formal statements and symbols, and its deep structure as the unique configuration of meanings, interpretations and implications. The deep structure can only be distinguished by appearances which are, essentially, the surface structure itself. Let us consider planning as a dual process comprising surface and deep structures. Planning obviously comprises a complex interplay of many factors of which we have relatively little real understanding. It can only be seriously analysed to the extent that we understand clearly its deep factors. Moreover, since we are referring only to planning which is intended to lead to change, and social behaviour is of central importance, we must learn, in Merton's phrasing, "to distinguish clearly between subjective categories dispositions and categories of observed consequences". The distinction between the surface and deep meaning of planning involves more than whether or not it has been successful — i.e. whether the results meet expectations. Analysis of the deep structure of planning could result in an addition to planning theory. Consideration of deep structure may well complicate the analysis of educational planning, because there is no reason to assume that deep structure operates in the same way as surface structure, although it is generally the latter which provides the formal base of educational plans. Contradictory processes may be exposed. However, an understanding of such contradictory processes is the essential preliminary to closing the gap between the desired outcome and the unexpected actual outcome.

Planning perception and change

The process of perception provides the basic intermediary variable between planning as a message for change and the social change itself. March and Simon in their book on organization analyze differentiation of perception as a function of the extent to which the environment provides multiple bases for the origin of communications.⁹ They show that as data transmitted become more complex, the language of an organization becomes less adequate, and then uncertainty absorption occurs closer to the source of information. "On the other hand, it is extremely difficult to communicate about intangible objects and non-standardized objects". This is a serious problem in educational planning. Planning problems are 'wicked' in the sense that Rittel and Webber used the term as compared with 'tame' problems, 'wicked' ones have no definitive formulation and so they fall back on elusive *political* judgment for their resolution. The formulation of a 'wicked' problem is the problem. Such problems have no 'stopping' rule. Solving the problem is identical with the process of understanding its nature, and there are no ends to causal chains that link interacting open-systems. There are no immediate or ultimate tests of a solution to a 'wicked' problem; solutions are neither 'true or false', nor even 'good or bad', but 'better or worse'

E. Dan Inbar

—based on levels of satisfaction. Every ‘wicked’ problem is essentially unique; it can be considered a symptom of other problems. Elboim-Dror’s definition of the characteristics of the three main educational sub-systems—policy-formation, management control and implementation—conforms essentially to Rittel and Webber’s analysis of ‘wicked’ problems. She maintains that the influence of internal actors, environmental factors and the unique characteristics of the educational process itself demonstrate the intangibility of educational goals. It is virtually impossible to establish and demonstrate solid means/ends relationships and inconsistency of educational goals.

In summary: Quite apart from the fact that it is subject to the conditions of any process of communication, the very content of educational planning exposes its message to perceptual variations, ambiguous meanings and diverse implications. Planning symbols cannot convey the full content of their message, so there is invariably a wide gap between its surface and deep structure.

The semantic properties of a message are transformed within the communication flow either through the use of omitting devices or by the introduction of distortions.¹⁰ Omission takes place when the message receptors do not grasp all its levels of meaning. This may be the result of reducing the contents through special encodings which transmit only segments, or through neglect of the full meaning of the message because of overload of information. Closely connected with the process of omission is the process of distortion where the meanings of messages are transformed through a wide variety of subjective devices. It is beyond the scope of this paper to list all the literature dealing with communicational distortions. However, it is worth mentioning Campbell’s list of systematic errors in communication systems.¹¹ They were traced to duplicatory processes, transmission of context, and reductive coding. Cyert and March¹² showed that decision-making systems develop codes for communication about the environment. This process of codification enables information to be assimilated through a relatively small number of classes of states and tends to reduce all possible states of the universe into a few arbitrary specified categories. In the words of Katz and Kahn, “systems can react only to those information signals to which they are attuned”.¹² This is aggravated by the tendency to develop what the psychologists term “perceptual constancies” which dramatize our relatively stable perception of objects.¹⁴

Adams and Bjock’s¹⁵ analysis of education in developing areas provides enlightening examples of such a process. The fostering of secondary vocational education and other terminal courses, ostensibly for creating marketable skills, may actually be intended to help preserve the elite character of higher education. Similarly, in order to preserve a selective élite, proponents of the “aristocratic-egalitarian” position for higher education will maintain that “universities must meet world standards” and that quantity must not be allowed to “subvert quality”. In the same fashion, the perennial discussion of equity versus efficiency in education underlines the problem of subjective perceptions. What does equity imply? An equal amount of education for everyone? Schooling sufficient to bring every child to a given standard? Education sufficient to permit each person to reach his potential? Continued access to schooling so long as gains in learning per input of teaching match some agreed norms? As Anderson and Bowman have pointed out, educational planning can be “properly assessed in application only as we place it in a broader context”.¹⁶

Refaela Bilsky’s research into the Public Health Service, analyzes the relationships between the central system and field agencies, showing how each group has its own view

of the planning process.¹⁷ The central office saw planning as a vehicle to gain more control; the field units saw it as a process which would increase local independence. As a result a new kind of centralization often develops, local-centralization. Decentralization is often conceived as local autarchy, which suffers in turn from most of the disadvantages of centralization. Our study of 1975 furnished empirical evidence of the different perceptions of the school-principal's authority and responsibility held by teachers, school principals, supervisors, and senior officials in the Ministry of Education. The school principal, caught in cross perceptual discrepancies, is faced with differing expectations.¹⁸

Taxonomic and Transformative Planning Approaches

The taxonomic approach to educational planning we define as the process which is based mainly on the surface structure of planning. Reliance is upon procedures, segmentation and on classification of content, implementers and time. It is concrete. Often it is atomistic in its implemental process and its division of labour. The taxonomic approach is based on the notion of a rational hierarchical structure for the planning activities and the implementation of plans. Generally it is quantitative in nature and frequently it makes use of mathematical models which reduce social decision to an abstract and manageable form. Such models do not greatly consider qualitative and external factors. For example, the supply of teachers frequently is held to be a function of salary, and the demand for education a function of per-capita income. Examples of such an approach are provided by the early work of Correa, Armitage and Smith, Thonstad, the personnel of the Swedish Central Bureau of Statistics, and Stone.¹⁹

Econometric models provide another example of the taxonomic approach. In these, the educational system is linked with the economic system with the relationship of the two (for the most part) one-way directed. This provides a kind of rational hierarchy. Tinbergen's model related requirements for graduates to rates of economic growth; Benard's determined the optimal allocation of resources between education and various types of economic activities; Adelman's and Bowles' models determined the resources to be allocated to different types of educational institutions.²⁰

Their common denominator is that they are based on a rational hierarchy, with determined relationships among their components. Miller, Galanter and Pribram²¹ define a plan as follows: "A plan is any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed"; Anderson and Bowman as "systematized analytical propositions". Undoubtedly such models (indeed the taxonomic approach generally) are functionally communicative since there is a need to appear to be advocating rationality when such behaviour is highly prized and rewarded. The transformative approach on the other hand is structured to include both the deep and surface aspects of the planning process. Much of the literature on planning stresses the psychological, sociological and political aspects of the process. Selznick's classic study of the TVA, analyzed the process of cooperation; Benveniste's case-study of Mexico analyzed the process of exchange; Friedman's Venezuelan study the process of dialogue.²²

At first sight the transformative approach may seem to be merely a combination of certain desirable features of the surface and deep structure of planning, but this is not so. It ought to be based on a continuous dual process of transformation. First, consciousness of both structures will enable the agents in the planning process (policy-makers, planners, implementers, clients, etc.) to move easily between the two levels. Secondly, the transformation of the message symbols themselves will convey more of the meaning of the

planning content. We are dealing here with two approaches to planning, *not* with planning strategies.* The underlying assumption of the transformative approach is that both structures are functional and perceptual biasing is not always dysfunctional. The deep structure is not only unavoidable, it is a necessary phase of the planning process. The implementation of any educational plan depends, in the last analysis, on the will, motivation, identification, and even the internalization processes of teachers, students and parents who are participating in the educational process. It therefore follows that transformation could increase the participants' motivation by introducing symbols and meanings which have more motivational effect. Sender and receiver may indeed have different interpretations of the message, due to ambiguity, and yet such multiple interpretations may reduce conflict and resistance to change. Elboim-Dror's analysis of the positive aspects of intangible and vaguely formulated educational goals provides an example.²³ Even though the message-receiver has absorbed the planning symbols, his own idiosyncracies will give them a subjective meaning. Moreover, educational planning is designed with more than one person in view. The receivers of the plans come from different social groups with different, often conflicting, interests. Miller has validated empirically that the likelihood of message-passing is inversely proportional to the distance between the participators.²⁴

Since social planning is based on both structures what is required is a dual process which gives proper consideration both to surface and deep structure. "Planners" (in the broadest sense) should be conscious of the multiple meaning of their own and others' planning symbols, should try to identify and understand them, and thereby assist their transformation from one level to another.

Figures 1 and 2 are simplified charts of the two approaches. The elements which appear in the first are generalized from the shared aspects of many models, and describe the process from a taxonomic viewpoint. The basic elements of the transformative approach (figure 2) are not presented in vertical-hierarchical flow but in horizontal form. The visual presentation is not just artistic convention. Shannon and Weaver's model of a general communication system which is presented horizontally is based on the process of message-transmitting, encoding noise, sources-decoding, and message-receiving.²⁵ Boulding's communication feedback model is based on such concepts as perception of information, transmitter of information and orders, interpreter, effector and transmitter of effects.²⁶ Figure 2 brings us closer to reality—goal-setting does not always initiate planning processes; implementation is not necessarily always the consequence of plans. The multiple feedback loops suggested in the figure are between the surface and deep structures of the process and between various other elements in the system which represent the transformative components of the planning process.

Four Processes Exemplified

Basing ourselves on the distinction between the surface and deep structure of planning, and using the transformative approach, we shall analyze four basic processes inherent in the educational planning cycle: planning as a process of structuralization; as a process of exposure; as a process of power re-allocation; and as a process generating tension.

I The first implicit planning process we shall discuss is the tendency to reinforce mechanisms of structuralization—i.e., structuralization of behaviour and institutionalization of

*A comparison of four planning strategies (rational, incremental, mixed scanning and radical) is given in David E. Berry's article "The Transfer of Planning Theories to Health Planning Practice", *Policy Science*, No. 5, pp. 343-361.

Figure 1 THE TAXONOMIC APPROACH TO PLANNING

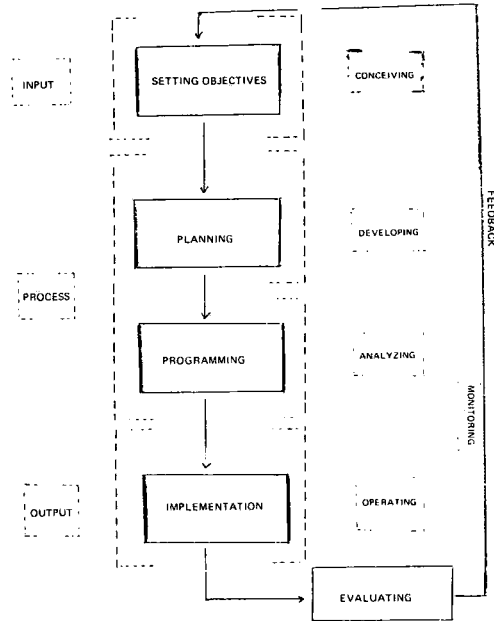
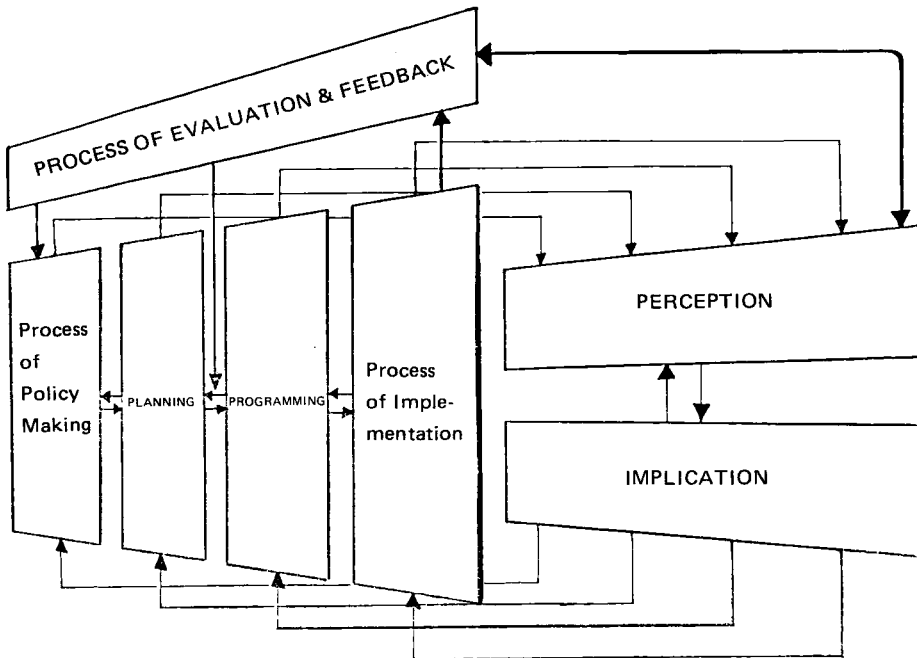


Figure 2 THE TRANSFORMATIVE APPROACH TO PLANNING



structures. This might be seen as paradoxical since planning is oriented toward change and good planning includes the dimensions of flexibility and feedback.²⁷ However, since it is easier to describe the formal than the informal and plans are based on formalized symbols, planning often assumes a descriptive structure, one indicating or specifying organizational procedures. It therefore develops and strengthens formal relationships. There is a tendency to adopt the surface structure of the message, the formalized aspects of the message symbols. It is easier to adjust ideas to new actions, than patterns of behaviour to new ideas.

In their resistance to change people tend to reinforce established patterns of behaviour so the planner should consider the possibility of merely ritual and symbolic change.²⁸ Ritual planning occurs when behaviour is changed without change of attitude. Symbolic planning occurs when pro-planning attitudes develop as a convenient psychological adjustment in order to avoid changed behaviour. The establishment of formal planning units generally is the first step, and frequently the only step taken, in the introduction of planning processes. The Waterston study of planning reveals that administrative aspects frequently provide a serious constraint on planning success.²⁹ But it has not yet been shown that an optimal administrative structure would make planning more successful. The crux of the matter is that planning processes cannot be precisely identified with the work of institutionalized planning units. The frequent studies of the formal aspects of planning seem to be due more to the relative ease with which they can be studied than to their importance. For example, the importance of planning units apparently concerned only with physical facilities planning extends far beyond their recognized task. In the Israeli educational reform, the Department of Mapping and Construction played a major part in implementation. And information gathering units began to undertake planning activities. What had been educational forecasts became planning targets.³⁰ As Ruesch and Kees put it, the danger "lies in the tendency to regard abstract principles as concrete entities...and confusing verbal symbols with actual events".³¹

II Planning is a process with an internal mechanism of exposure. The mechanism has three basic characteristics: exposure of basic flaws or errors, exposure of differences of standard and exposure of differences of preference. Planning is characterized by a dual nature – it is a means to change and, therefore, almost by definition, it must assume causal relationships even where there is poor evidence that they exist or have been correctly defined. With the taxonomic approach, where planning is based mainly on hierarchical, step by step implementation, the importance of causal relationships increases. According to Wildavsky "planning is, therefore, a form of social causation".³²

However, Rittel and Weber, in their distinction between wicked and tame problems underline the sad condition of causal relationship in social planning. Since problems of educational planning are essentially wicked, they are unique, interdependent, and their solution cannot be unequivocal. Maruyama's application of mutual causality to planning provides better insight into the problem of causality in planned social change. Mutual causality implies many causal loops, where similar results may occur from dissimilar conditions (due to a network of countervailing forces). Mutual causality is based on changeable categories depending on changeable situations. Everything must be interpreted in the relevant cultural and social contexts. So if the surface structure of the planning process stresses the hierarchic, one-way causal approach, its deep structure must stress mutual causality. Planning as a process for the deliberate indication of change exposes the limitations of our knowledge of social causality.

Planning tends to expose social indicators and social standards. When planning is designed to carry out social policy, it is based, explicitly or implicitly, on specified standards. However, the standards of social goals are intangible, unquantifiable or at least unmeasurable. They are derived from contemporary social norms.³³ Moreover, since educational planning is always oriented to different interests and social groups, the question of where the *public good* lies is bound to arise. Arrow analyses the problems of determining the public good and defines it as the "social welfare function". But in a democratic society, with the constraints imposed by processes of choice and preference, there is no logical construction of a social welfare function to represent the public good. The success of educational planning will be a function of the social perception of its consequences. And even if the surface structure of planning can be based on measurable standards, the success of the process (its public acceptance as a 'good') will be determined through its deep structure.

Not only is planning a process of making choices, choice exposes the need for decisions about preferences. Consequently, there is bound to be an exposure of the degree of consensus about social objectives. To choose explicitly between social objectives and priorities will expose the conflicting ideologies embedded in a society. In the same way, decisions about changes in the allocation of resources will expose conflicting social interests. Since planning must expose the assumptions underlying decisions, it is not surprising that people tend to conceive it as a means of translating at the operational level a policy already decided upon — rather than as a process of preparing a set of alternatives for choice, i.e., to decide preferences. The emphasis in much of the literature on the feasibility of optimization, rather than on the optimization of alternative possibilities, blurs an important characteristic of planning: the exercise of choice. Planning, like research is not a substitute for making a decision. The exercise of choice was seen by Davidoff and Reiner as a basic component in the development of a theory of planning.³⁴

However, planning requires more than consensus about objectives and means, it requires a common will and effort. Yet will, in the last analysis, is a function of perception, a function of the deep structure of the planning message.

III Plan implementation can be seen as a process of exercising power, when power is defined (as Weber has) as the chance to carry out actions even against the resistance of others. The amount of power required varies according to the potential amount of resistance to be overcome. But social power must be treated as a property of social relationships, which entail ties of mutual dependence. The impact of exposing conflicting interests in the process of plan implementation is determined by the distribution of power. On the other hand, planning, which implies re-ordering priorities and re-distributing resources, itself is a process of social power re-distribution. Therefore central educational planning is conceived as the politicization of social and economic exchange relationships. Ilchman and Uphoff offer a comprehensive analysis of planning and change in terms of exchange of such resources as goods, services, status, information and authority.³⁵

Since planning is related to a set of decisions to be realized, and any set of decisions is based on various degrees of uncertainty regarding their consequences, social power can be conceived as the conjunctive component between uncertainty and risk-taking. From this point of view, social power can be defined as the readiness to permit uncertainty and the ability to take risks.

E. Dan Inbar

The triangular relationship of planning, the social power to re-distribute resources, and the social power to take risks, explains one of the most common phenomena of educational planning—the professional and public advisory committee. These committees ensure public and system recognition that the plan is soundly based (on scientific knowledge, with emphasis on apparently technical considerations). They enable decision-makers to enlarge their powers of implementation sufficiently to overcome the resistance of interested parties. They broaden social consensus, and establish that uncertainty will be treated professionally. The professional committees enable the public to feel that decisions with important social consequences are well-based. The public committees on the other hand, re-assure the system that the decisions are ‘politically’ acceptable. They encourage the development of a social dialogue. The effectiveness of social dialogue cannot only be assessed in terms of its direct product—e.g. in the type of decisions or recommendations which result. Social dialogue is a transformative process. It assists the transformation from surface to deep structure and vice versa. Ideally it will reduce social conflict, increase consensus, reduce the gap between expectation and reality. Actually it might do the reverse. The emphasis on goal-setting, if it is accompanied by a disregard for alternative priorities, might well increase the gap between expectation and reality. The inability to reach a meaningful decision could result in increased social conflict. There is the danger of unnecessary work if commitment is unstable, so that during implementation whole sections of the plans have to be scrapped or changed. The commencement, or continuation of implementing work (by the administration) before decision is reached (i.e. during committee sessions, or in spite of committee sessions) could even increase social and political scepticism. Social dialogue is an important component in the whole process of plan legitimization. Martin Rein has written a basic article on the search for planning legitimacy, analysing different legitimacy sources; and R.W. Smith a basic theoretical analysis of the various forms and aspects of participatory planning.³⁶ Public committees can be the means of developing and establishing a net of activation bases. ‘Activation’ here is used in the sense adopted by Gross as the use of influence or any combination of methods to persuade, pressure and promote self-activation. The involvement of interest groups during the planning process serves as a basis for future activation of the plan.

IV Educational planning may be seen as a generator of tension in society. Here, tension is defined as the impact produced by awareness of the discrepancy between desired or expected state of affairs and the actual situation.³⁷ Each discrepancy means something different to different individuals and groups. According to Boulding, the image is the subjective structure of knowledge. It is constructed of all past experience, of imagination of the future, of facts and of values; and it determines the current behaviour of persons and organizations. Moreover, Boulding writes, “one of the most important propositions [of his theory] ... is that the value scales of any individual or organization are perhaps the most important single element determining the effect of the message it receives on his image of the world”.³⁸ T.B. Smith has evolved a matrix (based on Sollschan distinctions) of ten types of discrepancies which can be present at the level of the individual, the group and the organization.³⁹ Consequently different types of discrepancy (i.e., derived from different sub-systems, relationships or subject matter) will generate different degrees of tension.⁴⁰ Hence, the deep structure of educational planning implies a process of consolidating social desires and structuring expectations. Since there are always discrepancies between desire, expectation, and perceived reality, some tension is the inevitable accompaniment to educational planning. It is the degree of tension which is the unstable

ingredient in the process. A certain level of tension, as a source of motivation and action, is vital to the process. Too much tension will induce conservatism, authority will be reluctant to take risks.

Summary and Conclusions

In this paper we have described planning as a chain-reaction process, one oriented to the future change of present conditions or situations. From such a viewpoint it may be defined as a message which states the process of change, and plans become the formalized symbols of the message.

Since the operative implications of messages depend greatly upon the perception of the receiver, and every message as a linguistic utterance consists of a surface and a deep structure, a transformative component is necessary for entire comprehension of the message, i.e., for full awareness of its meaning and implications.

The inherent characteristics of the process of communication seem to make the taxonomic presentation of educational plans unavoidable. But educational planning always operates within a multi-perceptual framework, which can never be replaced by a single hierarchy of causation.

Individuals, groups, and organizations never merely passively adjust themselves to a plan. Messages are recognized and perceived through the intervention of people's own interests, motivations, expectations, and needs. Ultimately the meaning of the message (the plan) is the change it is intended to produce in social behaviour. However, even when plans are conceived as a system of specific rules which embody a definite conception of change, the interpretation of the meanings they bear is infinite.

The transformative approach to planning encourages mutual modification of perception through a process of communication and feedback. Many careful studies are required for the proper understanding of the way in which communication networks affect the flow of planning messages, and consequently the way in which educational plans are conceived and interpreted.

From the viewpoint of this paper, the optimum scope of an effective educational planning process is determined by the ability of the planners to comprehend and affect the relevant communication network, on the one hand, and their ability to develop and use transformative processes, on the other.

REFERENCES

1. Aaron Wildavsky, "If Planning is Everything Maybe It's Nothing", *Policy Sciences*, No. 4, 1973, pp. 127-153.
2. Horst N. Rittel and Melvin M. Webber, "Dilemmas in a General Theory of Planning", *Policy Sciences*, No. 4, 1973, pp. 155-169.
3. Magoroh Maruyama, "Hierarchists, Individualists and Mutualists", *Futures*, 1974, pp. 103-113.
4. Martin H. Krieger, "Some New Directions for Planning Theories", *American Institute of Planners Journal*, May 1974, pp. 156-163.
5. R. Diez-Hochleitner, "Educational Planning", *Economic and Social Aspects of Educational Planning*. Paris: UNESCO, 1964. Chapter IV, pp. 85-97.
6. H.A. Simon, *Administrative Behavior*, 2nd edition. New York: The Macmillan Co., 1957.
7. See Noam Chomsky, *Aspects of the Theory of Syntax*. Cambridge, Mass.: M.I.T. Press, 1965; and *Language and Mind*. New York: Harcourt Brace Jovanovich Inc., 1968.

E. Dan Inbar

8. Robert K. Merton, "Manifest and Latent Functions", *Social Theory and Social Structure*. Glencoe, Ill.: The Free Press, 1949.
9. J.G. March and H.A. Simon with H. Guetzkow, *Organization*. New York: Wiley, 1948, pp. 127, 164, 166.
10. Harold Guetzkow, "Communication in Organization", *Handbook of Organization*, J.G. March ed. Rand McNally, 1965. Chap. 12.
11. D.T. Campbell, "Systematic Error on the Part of Human Links in Communication Systems", *Information and Control*, 1958, No. 1, pp. 334-369.
12. R.M. Cyert and J.G. March. *A Behavioral Theory of the Firm*. Englewood Cliffs, N.J.: Prentice-Hall, 1963.
13. Daniel Katz and Robert L. Kahn, *The Social Psychology of Organization*. New York: John Wiley and Sons, Inc., 1966, p. 22.
14. See Ernst R. Hilgard, R.C. Atkinson and R.L. Atkinson, *Introduction to Psychology*, fifth edition. Harcourt Brace Jovanovich Inc., 1971, pp. 136-156. See also J. Macy, L.S. Christie and R.D. Luce, "Coding noise in a task oriented group", *Journal of Abnormal Social Psychology*, vol. 48, 1953, pp. 401-409, wherein is developed an ambiguity measure of semantic noise. On psychological noise interfering in communicational process, also see Harold J. Leavitt, *Managerial Psychology*, second edition. University of Chicago Press, 1964. On awareness and acceptance as related to different communicational methods, see E. Katz, "The two-step flow of communication: an up-to-date report on an hypothesis", *Public Opinion Quarterly*, vol. 21, 1957, pp. 61-78.
15. Don Adams and Robert M. Bjock, *Education in Developing Areas*. New York: David McKay Company, Inc., 1969.
16. Arnold Anderson and M.J. Bowman, "Theoretical Considerations in Educational Planning", *Educational Planning*, D. Adams, ed. Syracuse University Press, 1964, pp. 4-46.
17. Refaela Bilsky, *Planning in the Public Health Service*. New York: Humanities Press, and Jerusalem, Israel: Van Leer (in press).
18. E. Dan Inbar, "Perceptual gaps of authority and responsibility among educators", Hebrew University of Jerusalem, School of Education, 1975 (mimeo).
19. See Hector Correa, *The Economics of Human Resources*. Amsterdam: North Holland Publishing Co., 1963; Peter Armitage and Cyril Smith, "The Development of Computable Models of the British Educational System and their Possible Uses", *System Analysis in Educational Planning*. Paris: OECD 1966; Tore Thonstad, "A Mathematical Model of the Norwegian Educational System", *Ibid*; Richard Stone, "A Model of the Educational System", *Minerva*, Winter 1966, pp. 172-186.
20. Jan Tinbergen and H.C. Bos, "A Planning Model for the Educational Requirement of Economic Development", *The Residual Factor and Economic Growth*. Paris: OECD 1969, pp. 147-169; Jean Benard, "General Optimization Model for the Economy and Education", *System Analysis in Educational Planning*. Paris: OECD, March 1966; Inna Adelman, "A Linear Programming Model of Educational Planning - A Case Study of Argentina", presented at the Annual Meeting of the AEA, December 1965; Samuel Bowles, *Planning Educational Systems for Economic Growth*. Cambridge, Mass.: Harvard University Press, 1969.
21. George A. Miller, E. Galanter, and K.H. Pribram, *Plans and the Structure of Behavior*. New York: Holt-Dryden Books, 1960.
22. Philip Selznick, *TVA and the Grass Roots: A Study in the Sociology of Formal Organization*. New York: Harper Torchbooks, 1966; Guy Benveniste, *Bureaucracy and National Planning*. New York: Praeger Publishers, 1970; John Friedman, *Venezuela: From Doctrine to Dialogue*. National Planning Series, Syracuse University Press, 1965.
23. Rachel Elboim-Dror, "Some Characteristics of the Educational Policy Formation System", *Policy Sciences*, No. 1, 1970, pp. 231-253.
24. J.G. Miller, "Information Input Overload", *Self-Organizing System*. M.C. Yovits, G.T. Jacobi and G.D. Goldstein, eds. Washington, D.C.: Spartan, 1962, pp. 61-70.
25. Claude E. Shannon and Warren Weaver, *A Mathematical Theory of Communication*. Urbana, Ill.: University of Illinois Press, 1949.

26. Kenneth E. Boulding, *The Organizational Revolution: A Study in the Ethics of Economic Organization*. New York: Harper Brothers, 1953.
27. P. LeBreton and Dale A. Anning, *Planning Theory*. Prentice-Hall Inc., 1967.
28. Douglas E. Ashford, *Morocco-Tunisia, Politics and Planning*. National Planning Series. Syracuse, N.Y.: Syracuse University Press, 1965.
29. Albert Waterston, *Development Planning: Lessons of Experiences*. IBRD. Baltimore: The Johns Hopkins Press, 1965. See also United Nations, Economic Commission for Latin America, *Administrative Aspects of Planning*. New York: U.N., 1969.
30. E. Dan Inbar, "The Paradox of Feasible Planning: The Case of the Israeli Educational Reform", School of Education, Hebrew University of Jerusalem, 1974. (mimeo); see also Inbar and A. Blumental, "Forecasting in Education – A Means for Policy Making?", *Studies in Educational Administration and Organization*, No. 4, 1975 (in Hebrew).
31. J. Ruesch and W. Kees, *Nonverbal Communications: Notes on the Visual Perception of Human Relations*. Berkeley: University of California Press, 1956, p. 193.
32. Wildavsky, *op. cit.*, p. 132.
33. For discussion of the nature of social indicators and their importance for planning, see Itzhak Gal-Noor, "Social Indicators for Social Planning: The Case of Israel", *Social Indicators Research*, vol. 1, 1974.
34. Paul Davidoff and Thomas A. Reiner, "A Choice Theory of Planning", *The Journal of the American Institute of Planners*, vol. 28, May 1962.
35. Warren F. Ilchman and Norman T. Uphoff, *The Political Economy of Change*. Berkeley: University of California Press, 1969.
36. Martin Rein, "Social Planning: The Search for Legitimacy", *American Institute of Planners Journal*, July 1969, pp. 233-244; and Richard Warren Smith, "A Theoretical Basis for Participatory Planning", *Policy Sciences*, No. 4, 1973, pp. 275-295.
37. George K. Sollschan, "Working Papers on the Theory of Institutionalization", *Exploration in Social Change*, G.K. Sollschan and Walter Hirsch, eds. London: Routledge & Kegan-Paul, 1964.
38. Kenneth E. Boulding, *The Image*. The University of Michigan Press, 1969.
39. Thomas B. Smith, "The Policy Implementation Process", *Policy Sciences*, No. 4, 1973, pp. 197-209.
40. E. Dan Inbar, "The Educational Planning System: Change and Tension", *Futures*, April 1975, pp. 119-128.

MANAGING POLICY DEVELOPMENT IN PUBLIC SERVICE ORGANIZATIONS

Introduction

Policy analysis in public service organizations involves administrators, planners and researchers. Traditionally, the roles of these three have not been optimally interrelated. The researcher and planner frequently are not sufficiently sensitive to the issues relevant to the administrator. This may be due to their theoretical orientation. Or, it may occur because the administrators do not give the right information or most appropriate direction to them. A common problem is timing. The solution to policy issues cannot occur within the time constraints involved in developing the research design. By the time the methodology has been formulated, the key decisions on the issue have been made. An equally difficult problem is communication. The solution cannot easily be extracted from documents in which options are couched in the detailed and technical language of social science. In addition communication between administrators and planners and researchers is often thwarted when the latter concentrate on their studies' findings rather than on their implications for implementation.

In some organizations all three parties work well together. The planner and researcher are aware of the needs of the policy maker and they manage to incorporate these needs into their own working style. There is greater communication among the three so that the planner and researcher know the overall policy plan in which incremental research projects or planning issues are formulated. This contributes to realistic and practical planning and research roles.

When such a three-way network is institutionalized, careful delineation of roles becomes formalized in the organization – the policy-maker identifies the broad issues, the planner casts the issues in terms of their comprehensive implications and long-range perspective, and the researcher translates their assumptions into hypotheses, tests the hypotheses through data and prepares findings related to their major policy considerations.

This paper provides two perspectives, one written by a planner, the other by a researcher, of how the planning and research functions can be made integral to decision-making in public service organizations.

Perspectives of a Planner

Policy development is rarely treated as a legitimate and important function of large public organizations. Usually it is subjugated to maintenance functions, the day-by-day housekeeping chores which monopolize the energies of managers. It places a poor second to the compelling events of the political process, which normally move forward without the impediment of informed judgement.

*Deputy Commissioner of Education, Massachusetts (formerly Director of Planning for the Department of Education), and Director of Research and Assessment, Massachusetts Department of Education.

However, responsible management in the public sector requires organized policy development. In fact the only way public agencies can fulfill the purposes for which they were established is by identifying, defining and analyzing policy issues, exploring alternatives and determining desired policy directions. This is not to suggest that policy development should replace the maintenance responsibilities of an organization or the organization's necessary participation in the political process. But organized policy development should be recognized as the partner of housekeeping chores and an acknowledged force in the political arena.

The approach to policy development advocated here has three main ingredients:

- the careful positioning and protecting of planning staff in the organization's structure;
- the firm application of criteria to the planning staff's selection of issues; and
- the necessity for planning staff to proceed down two roads at once: the conceptual and the political.

1. The planning staff must have authority to act and at the same time be relatively sheltered from maintenance responsibilities.

Most desirable is the establishment of a small unit with substantial organizational stature reporting directly to the chief executive. We would prefer the unit to use project management techniques for each policy development task undertaken, but it is possible to adopt other organizational patterns. For example, a selection of the organization's top managers could be asked to devote a specific proportion of their time to policy development, or consultants working on a part-time basis could comprise the policy development staff. But these appear to be weaker alternatives than a small unit composed of staff working full-time on issues.

However composed, the unit's leadership must have stature, provided through job grade (salary), position authority or organizational proximity to the chief executive (or all three). The mandate under which the unit operates must be clearly stated by the chief executive and understood by all in the organization. Planning staff may utilize different operating styles depending upon the unit's composition, the issues being worked on, and the constraints of the working environment. In our opinion the most effective mode is one whereby a person takes full responsibility for the development of a policy issue, from initial definition to policy recommendation or first stages of implementation. As 'issue manager', the planner utilizes whatever array of resources are appropriate to illuminate the issue: university experts, independent consultants, knowledgeable individuals inside and outside the organization and its institutions, but, particularly, the agency's own research staff. Such a project management approach brings together, uses and replaces human and data resources according to the demands of the task.

Once the unit is established the planning staff begin devoting their energies to an appropriate set of issues or problems. Before plunging into what could well become an unmanageable morass, however, it is essential that they take careful stock of the number and kinds of issues to be addressed. Large public organizations operate amidst a conglomeration of complex problems that do not easily lend themselves to manipulation, even by the most astute and organized analysts. Taking stock begins with the question of who has the power to legitimate an issue. Who must put a stamp on it before the planners can begin work? First, the professional environment surrounding the organization will dictate that attention be paid to certain issues. The environment includes a composite of what the "literature" says as well as what experts, commentators and in

some cases judges in a court of law bring to bear. Second, the organization's "board of directors" and chief executive (its policy makers) will insist that certain issues be addressed. Third, the planning staff themselves, by virtue of their proximity to administrators information documenting current conditions, often are best able to define the issues worthy of concerted attention.

2. Once a list of issues has been generated the next concern is the criteria by which the unit can decide whether to invest its energies in a given issue. In most public organizations the list would be a long one indeed. Selectivity needs to be rigorously exercised. In our opinion, four criteria should govern: First, an issue is worth pursuing only if the agency for which the planners are working can have some serious effect on outcomes. This does not mean that the organization by itself has to be in a position to exert leverage. In some cases it is sufficient to recommend that somebody else, like a legislative body, take action. The key determinant is that the organization have either *control* or *influence*. In government agencies the latter is more likely than the former. It is surprising and therefore worth noting how many public organizations decide to try to do something about issues well outside their scope of control or influence. An example is a state education agency which enters the fray of school finance reform by addressing itself to questions of how state revenues should be raised, i.e. the taxation issue. The credibility of an education agency on taxation questions is almost nil; it is hard enough for it to have some influence on the matter of distribution of funds.

Second, the issue must be manageable. It must be perceived as having boundaries that allow it to be differentiated from other issues in the minds of reasonable people. A good example of an unmanageable issue is "community involvement in education". Every person, group and organization has a different view of the boundaries of this issue, so that it is almost impossible for the planning staff to define it sufficiently to actually begin working on it. On the other hand an issue like occupational education, while large and unwieldy, has enough agreement for conceptualization and analysis to take hold of it.

Third, it is preferable for the boundaries of an issue to cut across the responsibilities of more than one unit in the agency. It is extremely difficult for planning staff to maintain their foothold and make progress within an organization, while working on issues which observers and participants agree are the sole preserve of one organizational unit. A good example of a preferred issue is school finance reform which will touch the activities of almost every functional unit of an education agency.

Fourth, the issue should be one which is not likely to explode in a series of crises during critical stages of development. Adequate time must be available for analysis, testing of alternatives, and building of political bases. These steps may well take more than a year. An illustration of an issue which does not readily lend itself to policy development is school desegregation. There is no way to insert other than incidental rationality into the course of events which mark such an issue.

3. With the final selection of workable issues in hand, the planning unit begins its work in earnest. In our opinion, this work requires a careful mixture of conceptualization and political activity. At times the staff behave like a "think tank" operation, at times like political liaison personnel. For purposes of illustration here is a chronological outline of the steps taken in our state education agency, to ensure successful policy development:

The process of conceptual development of the issue begins with a literature search and extensive consultation with selected authorities. Reading and discussions with local, state and national experts are concentrated into the two or three months following the identification of the issue.

This intense intellectual exploration is followed by a period of mulling over the issue and leads to the identification of several key questions which will need to be addressed as policy development proceeds. By the end of these months there will also have emerged the initial delineation of desired outcomes. The outcomes are not necessarily restricted to those which the organization itself can achieve. They also include those for which the agency would need the assistance and cooperation of other organizations. This harks back to the notion that successful policy development will not only influence the agency's activities but will likely result in attempts to influence other organizations' actions.

During the early stages of the conceptualization of an issue, the planning staff also begins to take action on the political front. During the literature search, consultation etc., the staff identifies the primary actors who have had (or can have) an impact on the policy issue, other government agencies, private organizations, interest groups, key individuals and the community at large—all are examined carefully in terms of their views and positions on the issue and the potential effects they might have.

It is no simple matter to identify the right set of actors for a given issue. The traditional cast of individuals and organizations with interests in an issue may not be the most appropriate to support a particular policy direction. The issue of occupational education provides a good example. In addressing questions relating to occupational education it would be easy to restrict oneself to actors in the education sector, particularly the vocational educators. Only slight heed might be paid to business, labour and other employment interests. Such a tack would be a mistake. Who is chosen as a key actor depends in significant part upon the emerging policy direction to be pursued. Today, in occupational education, there is greater payoff in nurturing relationships outside the education establishment. The decision to pursue this sort of political strategy stems in great part from initial conceptual determinations.

After identifying actors the planning staff develop the strategy for engaging them in discussions on the policy issue at hand. The sooner this happens the better. In fact, it is most desirable to engage the actors in policy discussions even as the planner is being schooled. One technique we have used is to invite key actors (or their representatives) to an early session which the planner has with the expert consultants.

There is no single means of effectively bringing all actors into the process of policy development. Different issues seem to warrant different approaches. Our development of a statewide educational assessment program, for example, required the establishment of formal, widely representative advisory groups. School finance reform, on the other hand, involved periodic meetings with representatives of educational and municipal interests.

Once the key questions or concerns related to the issue and a tentative political strategy have been formulated, the planning staff and the agency's research unit begin to form the information base needed to undergird the policy decisions that will be addressed. Public agencies seem to have limitless reservoirs of data which they collect from their constituents, usually by law. Regrettably little of it is ever moulded into a form suitable for policy decisions. The planner's first step is to assess, with the help of the research

unit, the data at hand. The research staff then organize the information into a suitable form. With competent research assistance and good data processing capability within some three or four months, a descriptive data summary usually can be assembled which will be (with some interpretation) intelligible to administrators or a board of directors.

From the literature search that occurred in the first two months of work the planner culls other information as appropriate. He then relates it to the data compiled in conjunction with the research unit. In some cases, such selective information may be developed from a newly created information base. In occupational education for example two studies were commissioned, one to gather data and analyze the extent and nature of secondary school work experience programs in the state, a second to examine the effects of different sorts of occupational education on students who had graduated from high school several years before.

Naturally the development of an information base for an issue and the emergence of findings from it should be shared fully with the political actors invested in the issue.

After approximately one year's work the planning staff is ready to engage the chief executive and the board of directors in a full scale application of their attention to the issue. Prior to this time, they have mostly served as recipients of the planners' opinions and data presentations. Now they become active participants in the redefinition of the key questions and the initial formulation of policy. Over a period of at least three months they become as steeped in the issue as time will allow. The policy position that emerges should be theirs, not a product of staff work.

When the draft policy (a written statement, a report of recommended actions, or draft legislation) is put forth, its contents should not be 'news' to any of the political constituencies that have been consulted in the development of the issue. They should be given ample time to recast, redefine or reject findings and conclusions.

At this final stage of policy development, the conceptual and political are fully joined and bargaining, the guts of the political process, begins. As the chief executive and board of directors move into this phase they should be thoroughly appraised of, and committed to, the set of non-negotiable principles which underly the policy directions they are pursuing. These are fundamental elements not to be sacrificed in the political give-and-take. It is equally important that they are agreed upon the 'throw-away items', ingredients or adjustments that can be used for bargaining. For example, in school finance reform, the concept of equalizing state aid to local districts for elementary and secondary education was basic. The question of how much equalization and the measures to achieve it were negotiable. In occupational education, access to services without regard to locale was a fundamental principle; the kind of program to be offered was not.

Summary

We have suggested a particular approach to policy development, one which is suitable for large public agencies. To summarize: staff in an agency who assume responsibility for policy development must be vested with substantial authority, and provided with the time, resources and moral support necessary for the job. Whatever issues planning staff work on, they should be manageable issues, reduced to human proportions without sacrificing the edge which makes their treatment worthwhile. The process of policy development must be carefully interwoven with the political process. The goal is to ensure an enlightened and informed coalition of interests that supports change and moves into the political forum as it becomes necessary.

Reactions of a Researcher

When all the necessary research on a policy problem has been assembled, and “all the facts are in”, a decision still is needed. This is the critical stage in the whole process of research utilization. Traditionally, decision-making in public service organizations has not relied much on objective data. None of the well-known books on organizational decision-making mentions the influence of research.¹ They describe the influence of formal/informal patterns, the relationship to goals—at best, operations research. This omission is extensively documented in Yehezkal Dror’s recently published book, *Public Policy Making Reexamined*.² He describes the policy making process in human service organizations as: not structured by formal rules (that is, very much dependent on traditions, power relationships, formal division of work); formed by a large variety of sub-decisions, made at different locations in the organization (and receiving acknowledgement by virtue of the sub-unit’s power); involving a great deal of bargaining, coalition formation and lobbying; usually proceeding without clear operational goals, with little data and very little search for alternatives (instead, tending to follow the course of least resistance); reactive to acute and immediately pressing issues and therefore unable to rely on research.

Dror then describes the typical barriers against developing policy based on social science research. Among these constraints are: complexity of social sciences’ subject matter; inappropriateness of data; restraints of permitted findings; inability of social science to provide fool-proof solutions; alienation of social scientists from applied situations and pre-occupation with “pure” research.

The literature indicates that, in addition, certain organizational conditions exist within large scale institutions which tend to reduce the viability of research in the policy making process.³ One of the fundamental problems of research in large-scale organizations is that information gathering and analysis is costly. Because organizations are never assured, before the fact, that the research findings will ensure more successful results, they tend to support information gathering and data-analysis which have many end uses. However, since many decisions require specialized information, research studies addressed to a broad set of issues cannot be utilized to meet specific and limited policy questions. Moreover, even when special units for research and systems analysis are established, they traditionally deal with secondary issues of the organization. This adds to the alienation between policy-maker and researcher, to the greater isolation of the analyst, and hence to further retreat into subject areas which are irrelevant to the administrator.

Weinman and Wolner, in a recent American Educational Research Association article specifically relate the barriers (mentioned by Dror and others) to large-scale educational organizations.⁴

The policy and operation of a large scale educational system typically arise in reaction to immediate crises, or in adjustment directly to new needs. Decision-making is not adaptive to research findings or responsive to innovation suggested by research studies. By the time the researcher has studied the problem the issue is over and a ‘solution’ has been decided upon.

On the other hand, researchers within educational systems find it difficult to adjust to the realities of the organizational environment. Often they feel constrained by having to investigate issues which have been defined and assigned to them by administrators. In response, often they do not assume the commitment to the research process which is required to perform at their best. There is a sense of ‘compromise’ at having to design

research studies along lines which include other than quantifiable data and a sense of frustration in having to adjust 'facts' to political input or political climate. Such compromises and frustrations should not be exaggerated, but they do exist. Frequently it is less a question of what is done being unacceptable, than of what is not included being irritating.

Relating the Process of Data Analysis to Policy Making

In spite of these typical patterns, three basic conditions seem currently to be contributing to an improved relationship between researchers and decision-makers in such organizations as state education authorities. They are:

- Researchers are increasingly incorporating into their research design variables which represent structural and political realities.
- Researchers are increasingly interpreting data findings in the light of practical outcomes.
- Researchers are increasingly becoming a more integral part of the staff.

Structural and Political Reality

There are several factors which influence the ease with which, and degree to which, research findings will be drawn upon for policy making. Researchers in the public service realm increasingly realize the need to accommodate these factors in their work. The first is *methodology*.

For the policy maker to relate to the research study, its design must speak to a layman's needs and limitations. The researcher must explain in simple terms the theoretical premises underlying the study, must describe for the administrator the reasons that certain questions were asked in a given form and the process by which the results were obtained, and must present the findings in a clear and concise fashion free from the jargon of his discipline. The first two conditions will reduce the administrator's risk in relying upon the research findings. The latter will increase the ease and immediacy of their use. These points are illustrated in the public presentation of a statewide assessment program. For a chief state school officer to announce statewide trends in pupil performance to legislators, educational administrators, professional organizations, the press and the public, he must clearly understand why certain skills rather than others were tested, what is the significance of the figures relative to national and regional scores and to what extent conclusions can be drawn from the reported scores.

Similarly, in order to announce future trends in enrollment patterns, a chief administrative officer must understand in a general way the type of forecasting technique used, the extent to which reported patterns are likely to continue, and the degree to which such local trends differ from national or regional ones. Only if the researcher provides information to the policy maker in such a way as to clearly substantiate the manner in which the findings were derived will the latter feel sufficiently comfortable and confident with them to present them to the public. Not only must he be clear about the findings themselves but also their most obvious implications and effects.

In addition to meeting the needs for accountability and clear presentation to the public, the research methodology must relate to actual conditions. The research must be conducted in the 'real world' and be sufficiently comprehensive in scope not to isolate issues from the context in which they exist.

This is an important consideration since it constitutes a frequent limitation of research studies. All too often a limited number of contributing features of a condition are related to results without examining the related, not easily quantifiable, conditions. For example, the initial design of a statewide study to examine the impact of elementary school instruction in foreign languages on secondary school foreign language achievement and interest, did not include such factors as the provision of extra-curricular and staff development activities or the background characteristics of the student. They had been omitted in order to focus on policy-related issues and avoid intrusion into areas which might be politically sensitive. Yet, the answers to such major questions as the degree of student interest in the foreign language would have remained unknown had such items as parental encouragement, course content, school staff communication, and amount of related extra-curricular activities provided by the school not been incorporated into the design.

The second factor is *feasibility*.

A research study will be judged to be useful only to the extent that its findings are seen as being reasonable. In particular, the range and time frame of implementation are critical. Especially important is the extent to which the results could be adopted on an experimental basis. For example, many recent state and city manpower studies report the mismatch between job market needs and types of training being provided by educational institutions. Their conclusions suggest that the mismatch be alleviated by expanding enrollment and facilities in specified undersupplied areas and decreasing enrollment in increasingly obsolescent career sectors. Because the implication of these suggestions involves a system-wide redistribution of programs rather than a gradual incremental change, little has been done to implement the findings. Only in cases where satellite arrangements with vocational school districts exist, or contractual and collaborative programs with industry, business and public service have been established, have the studies' recommendations actually been implemented. Such arrangements permit reduction in the investment of time, personnel and money and therefore encourage the implementation of the research findings.

Recognition of the vested interests within an educational system is critical in casting research findings, and it constitutes another component of feasibility. An extensive research study on high school work experience programs will provide an illustration. Its 200 page report described the topology of programs involving secondary school students in paid or volunteer work experience in a variety of industrial, governmental, and institutional settings. On the basis of the analysis numerous recommendations were made. However each took into account the legal and fiscal restraints of the employer, the time and role constraints of on-site supervisors, the accountability concerns of high school principals, the training limitations of program directors and the scheduling difficulties imposed on classroom teachers.

The third factor is *utilization*.

The extent to which implementation is built into the research design is critical in terms of its value to policy-makers. For such concerns to be incorporated the researcher must identify, early, the potential users of the findings and the specific issues of their concern. He must also consider the degree to which the implications of the study's results avoid jeopardizing, or take into consideration, areas not touched upon by the research design. Another important aspect of utilization is the extent to which the researcher considers the effectiveness of the data's implications. For example, recent

state examination of school crime acknowledges the fact that the utility of such a study depends on whether data on this subject are regularly collected and available. Only to the degree that administrators will report the number and nature of incidents in their schools can research analysis be made and policy recommendations formulated. Of importance to decision-makers is the extent to which the researcher can, from his study, with validity, provide more than one policy alternative and can examine the value of one alternative over another on such features as cost and ease of implementation or replicability.

The fourth factor is the *political* one.

Research can be of use to policy makers to the extent that the human factors influencing acceptance of its recommendations are taken into consideration. Two issues are involved: the degree to which those affected by the outcomes are involved in the research process, the interpretation of its results, and the development of consequent recommendations; and, the degree to which the research implications recognize the decision-maker's own efforts.

An example of the former may be seen in the implementation of the statewide educational assessment program already referred to in this article.

The planning, design and implementation of the Massachusetts Statewide Educational Assessment Program was an interactive process between representatives of the Department of Education, and members of educational organizations and citizens throughout the state. In its initial development advisory committees were established in the six educational regions of the state, composed of educational administrators, public officials, businessmen, teachers and students. The participants chose the subjects to be addressed in the first phase of the program and the objectives to be examined in each subject area. Once designed, support for the assessment program was elicited from the state's local school superintendents, elementary and secondary school principals, and school committee associations. Then, workshops were held with superintendents throughout the state to explain the purpose and administration of the assessment program. Attitudes of fear and skepticism had to be allayed with assurances of anonymity and examples of ways in which the information might be helpful to them.

Such assurances were particularly important when dealing with teachers and their association (MTA). Initially the MTA was critical of the program's possible negative repercussions, but it became a major partner in the assessment after several sessions during which Department and MTA representatives reviewed the teachers' demands regarding the content and implementation of the program. Together they constructed the questionnaires to be distributed, and jointly published an article in the teachers' association journal which described the purposes of the program. Finally, workshops were held for teachers throughout the state in which they raised whatever questions were of concern to them. As a result they actively participated in the assessment activities. A number of teachers joined the regional assessment advisory groups, some became involved in local evaluation programs and all were placed on a special mailing list to receive updated information about the program. Assessment became one of the rare issues and activities around which teachers were directly contacted for advice and information, and their demands were incorporated into the program as it was developed.

Once the results of the assessment were collected, members of the assessment advisory groups and representatives of the teachers' association were brought together to discuss the content and format of the publications which would report the findings. They made

suggestions as to vocabulary, structure and style, and the inclusion and description of specific information.

Practical Outcomes

Interpretation of data findings adds to a research study a subjective component which is required to translate them into practical outcomes. Increasingly, researchers are becoming aware of the need to enhance this interpretation by:

- considering the findings in terms of their financial implications;
- weighing the results in terms of the decision-maker's knowledge of public expectations, demands or acceptance;
- relating them to the organization's current (or potential) resources;
- relating them (or their implications) to previous decisions;
- extracting those findings which will cause least organizational strain;
- comparing them to practices of other organizations and applying (directly or with adaptation) already implemented procedures;
- knowing what types of policy responses previously were successful (or unsuccessful) and identifying comparable (or opposite solutions).

A major component of interpretation is reliance on the expected replicability of previous circumstances to anticipated conditions. In some cases practical recommendations drawn from research findings reflect a direct application of prior successful policies. For example, in a state study of secondary school conditions the recommendation was made that more alternative education programs be offered students in order to provide them with options relevant to their interests, needs, and rate of development. This was supplemented with the proposal that such programs be inter-disciplinary in content in order to allow students the opportunity for multi-dimensional understanding and discovery. Underlying the latter proposal was a familiarity with particular post-secondary workshops in which an inter-disciplinary curriculum had significantly helped students in their academic and personal development. It was argued that since the program had proved beneficial to college-age students it would have comparable impact on a younger group, and might therefore accomplish the desired goals.

Another example: In a recent state study of school vandalism, the researchers proposed that a special lump-sum appropriation be provided for purchase of security equipment to reduce easy entry to school buildings and that the money not be randomly allocated but based on the individual school's record of past security problems. In proposing this restriction, the researchers were attempting to incorporate expected administrative criteria (cost limitations, priority of need) into their proposal. They did so not only because they agreed with such constraints, but in order to increase the probability of the recommendations being adopted. They also recommended that security devices be used only to maintain school building safety and not to survey student activities—in times characterized by student challenges to authority, they were aware that a 'law and order' approach to security might well provoke student opposition rather than insure tranquillity. In this suggestion the researchers were not reacting to administrative criteria but to anticipated implementation problems.

Integrating the Research and Planning Staff

The relationship between researcher and policy maker is not only dependent upon the nature and utility of the work being done, it is crucially dependent upon the position of the research office in the organization. There must be formal mechanisms whereby the research results are translated into policy. Most public service organizations lack a unit specifically responsible for the use of research for policy determination. Planning units should be established to fill the void. The planner, holding a relatively highly-placed staff administrative position, without line operating duties, can be objective in analyzing the needs of the total organization, can be sensitive both to the data emerging from research and to the possibilities for change in the organization. He can thus gauge the flexibility and constraints of the system in accepting the changes implied by the results of research. The planner serves an intermediary role, working closely with the researcher. While the researchers alone design studies, conduct data gathering and prepare the data findings, the translation of their findings into policy recommendations should be done in conjunction with the comprehensive and long-range perspective of the planner. Interpretation of the data is usually enhanced if assumptions used to link research to policy recommendations reflect the sensitivity of the planner.

To the extent that the policy planner is an arm of the decision-maker, the researcher becomes an extension of that arm. When he has been brought into the communication networks which focus on implementation, the researcher is exposed to the organizational and political conditions of the agency. He can then appropriately analyze and interpret, rather than simply report, data. Increased proximity and familiarity will permit researchers to foresee certain system problems which are not yet critical so that they can be ready with policy-related findings and recommendations at the appropriate time. Thus, they gain the credibility and acceptance necessary if they are to become an integral and central part of the organization.

Most of what has been described above involves the changed behaviour, awareness and roles of researchers. The changed behaviour, of course, cannot only be one-sided. Through the planner, the researcher should affect the behaviour of decision-makers and the whole process by which the organization develops its policies.

REFERENCES

1. See G. Steiner, *The Creative Organization*, Chicago, Illinois: University of Chicago Press, 1965; Etzioni (ed.), *Reading in Modern Organizations*, Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1969; Bennis (ed.), *American Bureaucracy*, Chicago, Illinois: Aldine Press, 1970.
2. Yehezkal Dror, *Public Policy Making Reexamined*, San Francisco: Chandler, 1968.
3. V. Thompson, "Bureaucracy and Innovation", *Administrative Science Quarterly*, 1965; D. Zand, "Collateral Organization: A New Change Strategy", *Journal of Applied Behavioral Science*, 1974, vol. 10, no. 1, pp. 63-89.
4. J. Weinman, and T. Wolner, "Post-Bureaucratic Organization and Educational Innovation", *American Education Research Association*, 1975.

THE IMPACT OF CANADIAN FEDERAL FINANCIAL ARRANGEMENTS ON PROVINCIAL EDUCATIONAL SYSTEMS

Introduction

This paper will discuss three topics in a Canadian context: interprovincial or regional inequities in the money available for education and the money spent on it; federal attempts to remedy or mitigate these inequities; and, future federal policies in this area. We shall deal mainly with elementary and secondary education. There are two reasons for this: The most obvious is that these are the sectors we understand best because our work mainly deals with their problems. The second, is that the *least* direct federal involvement has been in the financing of these sectors and their inequities are the greatest. Before discussing the inequities and estimating the impact of federal policies upon them, it will be useful, for non-Canadians, to begin with a brief overview of the financing of education in Canada.

The Canadian equivalent of the United States Constitution, the British North America Act of 1867, gave each province the right and the responsibility to develop and administer its own school system. Thus, ten distinct provincial systems of elementary and secondary education have evolved in Canada.

All provinces have local school boards and most of the revenue for education is derived from a combination of local property taxes and provincial government grants from general revenue. In the past decade two major trends developed across all ten systems. The first was the increase in relative importance of post-secondary education and vocational training as shares of total spending on formal education (see Table 1). For example, between 1961 and 1971 spending for elementary and secondary education decreased from 78% to 65% of the total, while spending for post-secondary education increased from 19% to 29% and that for vocational training from 3% to 6% over the same period. In part this shift has been due to demographic changes, but even more to unprecedented growth in participation at the upper levels of education. To a large extent, the expansion was made financially possible by federal transfer payments and federal/provincial revenue-sharing arrangements designed specifically to finance post-secondary education. The second trend has been the move away from local property taxation as the prime revenue producer for elementary and secondary education toward provincewide financing. This trend was also largely made possible by federal revenue-sharing and general-purpose equalization payments to the provinces, as we shall show in this paper.

For Canada as a whole, the provincial share of funds for elementary and secondary education increased from 43% in 1961 to 60% in 1971, and it continues to grow (see Table 2). Over the same period this was matched by a drop in the local share from 46% to 32%. Federal direct spending, mainly for the education of native peoples and the dependents of armed forces personnel, also decreased—from 4.1% to 3.5% over the

*Coordinator of Economic Studies, Canadian Teachers' Federation. This was one of the papers presented in the Canadian regional program of the annual conference of the *International Society of Educational Planners*, San Francisco, California, June 22-25, 1975.

TABLE 1 CHANGES IN THE DISTRIBUTION OF TOTAL SPENDING FOR FORMAL EDUCATION IN CANADA, 1961 TO 1971

Sector	Percentage Distribution		Changes in Shares 1961 to 1971
	1961	1971	
Elementary and Secondary	77.7	65.3	-12.4
Post-Secondary			
- Non-University	3.0	6.0	+ 3.0
- University	16.1	22.9	+ 6.8
Sub Total	19.1	28.9	+ 9.8
Vocational Training	3.2	5.8	+ 2.6
TOTAL PERCENTAGE	100.0	100.0	-
In thousands of dollars	1,930,671	8,264,640 ¹	...

¹Preliminary estimate

Source: Statistics Canada, Education, Science and Culture Division, *Elementary and Secondary Education - Financial Statistics, 1971*. Ottawa: Information Canada, 1975. Derived from Table A.

TABLE 2 CHANGES IN COST SHARING FOR ELEMENTARY AND SECONDARY EDUCATION IN CANADA, 1961 TO 1971

Sources of funds	Percentage Distribution		Changes in Shares 1961 to 1971
	1961	1971	
Local Taxation	46.0	32.0	-14.0
Provincial Government	42.6	59.7	+17.1
Federal Government	4.1	3.5	- 0.6
Fees	3.5	1.8	- 1.7
Other Sources	3.8	3.0	- 0.8
TOTAL PERCENTAGE	100.0	100.0	-
In thousands of dollars	1,499,459	5,393,823	...

Source: Statistics Canada, Education, Science and Culture Division, *Elementary and Secondary Education - Financial Statistics, 1971*. Ottawa: Information Canada, 1975. Derived from Table C.

decade. Estimates for the years since 1971/72 indicate that the share of school board revenue raised from local services has continued to decline and that the trend will continue, but probably at a slower rate.

By province, the provincial share of total elementary and secondary spending varied in 1971 from 88% (in Newfoundland) to 49% (in Saskatchewan, see Table 3). In Newfoundland, New Brunswick and (since 1972) Prince Edward Island, the provincial governments now raise between 95% and 100% of school board revenue. In Nova Scotia, Quebec and the four Western Provinces, variations of foundation programs are in effect. In most cases, provincial equalization grants make up the difference between the yield from provincially determined levies on real property and variously defined standard programs. Alberta recently eliminated a 30 mill levy on property, i.e., in effect opted for provincial funding. The Province of Ontario meets approximately 60% of school board expenditures under a system of percentage equalizing grants which are adjusted by cost-related weighting factors.

TABLE 3 COST SHARING FOR ELEMENTARY AND SECONDARY EDUCATION IN CANADA, BY PROVINCE, 1971

Province	Percentage Distribution					Total	Total Expenditure ¹
	Local Taxation	Provincial Government	Federal Government	Fees	Other Sources		
Nfld.	0.7	88.1	3.2	2.4	5.6	100.0	90,061
P.E.I.	20.6	72.0	7.0	0.0	0.4	100.0	19,962
N.S.	37.5	58.6	3.2	...	0.7	100.0	140,797
N.B.	0.0	95.5	4.2	0.0	0.3	100.0	118,042
Que.	29.1	64.8	1.9	0.7	3.5	100.0	1,525,007
Ont.	38.7	59.5	0.3	0.2	1.3	100.0	1,982,309
Man.	37.6	56.7	3.9	0.5	1.3	100.0	206,067
Sask.	46.3	48.7	3.0	0.6	1.4	100.0	177,656
Alta.	38.0	58.0	1.2	0.7	2.1	100.0	383,171
B.C.	36.5	57.9	0.3	...	5.3	100.0	414,665
TOTAL							
¹ Expenditures in thousands of dollars	1,724,720	3,123,135	67,288	21,270	121,324	—	5,057,737

Source: Statistics Canada, Education, Science and Culture Division. *Elementary and Secondary Education - Financial Statistics 1971*. Ottawa: Information Canada, 1975. Derived from Table 1.

Interprovincial Differences in Fiscal Capacity and Ability to Finance Education

Before we begin discussion of the revenues available for education we must first distinguish between the concepts of fiscal capacity and relative ability. The fiscal capacity of a government consists of the financial resources on which it can draw to provide all of the services required by its people. Financial ability, on the other hand, refers to the relative fiscal capacities of government jurisdictions of varying size. To convert measures of fiscal capacity into measures of relative ability, gross fiscal capacity data are reduced to a per capita basis by applying a measure of program or fiscal need, usually a demographic factor.

Relative ability to finance all public services would relate fiscal capacity to total population. Relative ability to finance education would relate fiscal capacity to the population of school age. If fiscal need as well as real need were taken into account, relative ability would relate fiscal capacity to weighted population of school age. The weighting factor would, of course, consist of some standardized method for determining differences in unit costs of providing a given standard of schooling to the same child in different communities and to children with different capacities and socio-economic backgrounds in the same community. Little progress has been made in Canada in developing such a comprehensive education price index inter-provincially although some provinces, notably Ontario, have developed weighting factors to be used within their borders.

Unfortunately, there is no agreement on the ideal way to measure fiscal capacity. The concept itself is elusive and techniques for measuring it tend to be arbitrary and fraught with conceptual and practical difficulties. However, at the ends of the spectrum of possibilities it is possible to identify two distinct approaches: (1) it may be viewed as the ultimate pool of resources on which a government may draw by imposing taxes, that is, the tax bases, or (2) it may be viewed as the revenue which would result from applying a uniform representative tax rate to selected tax bases in different jurisdictions. Because the representative tax system approach recognizes variations both in the economic structures of the provinces and in their taxing practices it is preferred, both in the literature and, increasingly, in practice.¹

Since the choice of an ideal measure of fiscal capacity has not been resolved, the most reasonable procedure is to use several measures, each representing a different position in the range of possibilities extending from the pool of resources from which most taxes are paid to the actual tax bases and the average rates levied. Four such measures are: personal income as measured in the Canadian National Accounts; total declared income above an arbitrarily selected subsistence level of income; taxable income; and the yield of a representative tax system based on sixteen sources of provincial revenue plus local taxation. These four measures of fiscal capacity have been used as bases for measures of relative ability to finance all public services per head of population, and to finance elementary and secondary education per weighted child of school age. The relative ability to finance education for all provinces for 1960, 1965 and 1970 is shown in Table 4, and we shall merely summarize the findings.

The same provinces prove to have had relatively low and relatively high financial ability regardless of how it is measured. Ontario, British Columbia and sometimes Alberta have been above the national average of financial ability, the four Atlantic Provinces and sometimes Saskatchewan have been well below it. Only for Alberta and Saskatchewan do different measures produce substantially different fiscal capacity ratios, based on the representative tax system approach. This was due to the failure of personal income or personal taxation statistics to reflect income derived from indigenous resources owned by non residents.

TABLE 4 FOUR MEASURES OF RELATIVE ABILITY TO FINANCE EDUCATIONAL NEEDS IN CANADA INDEXES BY PROVINCE, SELECTED YEARS FROM 1960 TO 1970 (National Average = 100.0)

Province	Based on Dollars Per Weighted School-Age Child (5 to 19) of										
	Personal Income		Total Declared Income Over \$2500 ¹				Taxable Income		Representative Tax System ²		
	1960	1965	1970	1960	1965	1970	1960	1965	1970	1967	1970
Nfld.	44.6	47.9	53.7	-	37.3	42.7	30.2	32.0	39.0	33.4	37.9
P.E.I.	50.8	55.5	62.3	-	36.2	44.0	26.1	32.4	40.1	48.2	47.1
N.S.	71.6	70.7	76.7	-	59.5	69.8	51.7	53.5	65.1	60.3	65.0
N.B.	57.7	59.0	65.3	-	49.5	56.4	39.5	43.8	51.4	41.7	47.2
ATLANTIC REGION	58.9	60.0	66.0	-	49.1	57.0	40.8	43.5	52.3	46.4	51.0
Quebec	81.2	85.9	86.5	-	83.6	85.2	72.3	80.4	82.8	84.6	84.6
Ontario	128.4	124.3	123.2	-	132.3	127.6	145.8	137.3	131.3	119.9	119.7
Manitoba	102.1	96.7	95.3	-	88.3	90.8	93.9	84.9	89.3	87.0	91.7
Saskatchewan	87.3	88.3	69.8	-	77.2	61.9	66.2	73.5	58.0	98.1	93.1
Alberta	100.9	96.5	96.3	-	89.2	92.9	99.0	89.0	93.0	128.5	120.0
PRAIRIE REGION	97.2	94.2	88.9	-	85.5	83.9	87.6	83.4	82.5	108.6	105.1
B.C.	128.6	123.0	115.8	-	132.6	122.4	142.8	137.3	124.5	125.9	121.7
TOTAL	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0
ACTUAL WEIGHTED AVERAGE (\$)	5079	5923	8634	-	3912	6101	1664	2372	4345	1157	1656
INDEX OF DISPERSION (%) ³	35.1	31.4	27.4	-	44.0	37.6	56.3	50.0	42.2	43.0	38.9

¹To obtain approximately equivalent purchasing power in earlier years, \$2500 in 1970 was deflated using the Consumer Price Index. Thus, the calculations for 1960 and 1965 were based on tax returns over \$1946 and \$2070, respectively.

²Consists of the yield of 16 provincial revenue sources when national average rates are applied to provincial bases.

³The Index of Dispersion used here is the coefficient of variation which is the standard deviation divided by the arithmetic mean, expressed as a percentage. The percentages shown relate to the dispersion of the actual values.

Source: Wilfred J. Brown. *The Impact of Federal Financial Support on Elementary and Secondary Education in Canada*. Ottawa: Canadian Teachers' Federation, 1975, Tables 17 and 18.

The major differences among the measures of fiscal capacity and the ratios based on them was not in the rankings of the provinces but in the spread or dispersion of these values. In 1970, for example, the coefficients of variation of provincial fiscal capacities per weighted child of school age were as follows: personal income, 27.4%; total declared income over \$2,500, 37.6%, taxable income, 42.2%; and the yield of a representative provincial tax system plus local tax revenue, 38.9%. These values are somewhat higher than the corresponding values based on fiscal capacity per capita, suggesting greater interprovincial variation in financial ability to meet needs for elementary and secondary education than for the total range of provincial-local services.

Historically, the most notable change in provincial indexes based on the four measures of fiscal capacity has been a narrowing of the dispersion of values among provinces. In the case of all four measures, the coefficients of variation for 1970 were lower than for any earlier years for which calculations were made. In fact, for measures based on personal income, this trend continued to 1973 (the most recent year of estimates) and can be expected to continue in the future. There are several reasons for this: the steady growth of federal transfer payments to *persons*, regional development programs, and the influence of direct and indirect spending programs and unconditional transfers upon provincial-local services generally and elementary and secondary education particularly.

Interprovincial Differences in Spending Per Pupil

To what extent does a more equal distribution of financial resources for education contribute to a more equal distribution of educational opportunity in elementary and secondary education? Because of our extremely limited knowledge of the nature and magnitude of the inputs into and outputs from the educational system, this is a question impossible to answer precisely. In fact, in Canada there is no general agreement on a definition of the term "equal educational opportunity". In a paper commissioned by the Canadian Teachers' Federation, Dr. Walter Hettich (and others) from the Economic Council of Canada stated:

It is not clear what is meant by equality of opportunity nor is it clear how it can be achieved. Equality of opportunity may refer to equal expenditures per pupil, it may refer to compensatory education, it may refer to equal rates of participation for students of equivalent ability, it may refer to equal participation for students of all social classes.²

It is recognized, of course, that the output of the schools may be affected as much by the quality of health and social welfare programs affecting the home environments of pupils as by the funds directly available for education.

Nevertheless, some indications of the degree of inequality can be obtained by examining differences in expenditure per pupil; especially when these differences are large (see Table 5). For example, in 1962 current operating expenditure per enrolled pupil varied by province from \$120 in Newfoundland to \$343 in Alberta, and the average for all provinces was \$269. The coefficient of variation among values for all provinces was 31.2%. By 1972, the average expenditure had risen by 224% to \$871, and the coefficient of variation had decreased to 20.4%. Although the seven provinces which had been below the national average of per pupil spending in 1962 were still below it in 1972, there were some very important gains as indicated by the coefficients of variation.

TABLE 5 GROWTH AND VARIATION IN CURRENT OPERATING EXPENDITURE PER PUPIL, 1962 AND 1972

Province	1962 (in dollars)	Percentage of National Average	1972 (in dollars)	Percentage of National Average	Percentage Increase 1962 to 1972
Nfld.	120	44.6	534 ¹	61.3	345
P.E.I.	152	56.5	625 ¹	71.8	311
N.S.	188	69.9	642	73.7	241
N.B.	177	65.8	547	62.8	209
Que.	237	88.1	817 ¹	93.8	245
Ont.	291	108.2	1007	115.6	246
Man.	279	103.7	833	95.6	198
Sask.	301	111.9	767	88.1	155
Alta.	343	127.5	935	107.4	173
B.C.	341	126.8	852	97.8	150
All Provinces	269	100.0	871	100.0	224
Coefficient of Variation ²	31.2%	—	20.4%	—	—

¹ Estimate

² Standard Deviation, divided by the unweighted arithmetic mean, expressed as a percentage.

Source: 1962: Statistics Canada, Education, Science and Culture Division, *Decade of Education Finance, 1960-1969*. Ottawa: Information Canada, July 1974. Derived from Tables 4 and 6.

1972: Statistics Canada, Education, Science and Culture Division, *Financial Statistics of School Boards*. Ottawa: Statistics Canada, February 1975. Table 1.

These measures of dispersion do, however, conceal several undesirable changes in relative position. For example, New Brunswick, Manitoba and Saskatchewan, which were all below the national average in 1962, had declined further by 1972 while Ontario had increased its relative position from 108.2% to 115.6% of the national average.

It is clear from the empirical evidence that substantial inter-provincial differences exist in the relative financial ability to finance education and in the relative amounts spent for elementary and secondary schooling. Despite the progress which has been made in reducing extreme interprovincial differences, both in the revenue available for education and the money spent on it, substantial differences remain.

TABLE 6 RELATIVE IMPORTANCE OF FEDERAL TRANSFER PAYMENTS AS A SOURCE OF PROVINCIAL REVENUE, 1972

Source	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	All Prov.
I. REVENUE FROM OWN SOURCES (%)	47.7	49.9	58.0	56.5	78.0	80.7	67.3	62.5	79.7	83.3	76.3
II. TRANSFERS											
A. Federal											
1. General Purpose Equalization	24.3	20.9	19.2	20.4	8.6	—	10.7	18.3	—	—	5.8
Other ¹	2.7	2.1	0.6	0.4	3.9	0.8	0.6	0.5	1.6	0.4	1.8
Sub Total	27.0	23.0	19.8	20.8	12.5	0.8	11.3	18.8	1.6	0.4	7.6
2. Specific Purpose Education	3.3	3.7	3.7	1.7	3.5	2.8	4.0	2.3	3.8	1.1	3.0
Other ²	22.0	23.4	18.5	20.9	5.4	15.6	17.0	16.1	14.9	14.2	12.8
Sub Total	25.3	27.1	22.2	22.6	8.9	18.4	21.0	18.4	18.7	15.3	15.8
From Fed. Gov't Enterprise	—	—	—	—	0.3	—	—	—	—	—	0.1
Total Federal	52.3	50.1	42.0	43.4	21.7	19.2	32.3	37.2	20.3	15.7	23.5
B. Local	—	—	—	0.1	0.3	0.1	0.4	0.3	—	1.0	0.2
TOTAL TRANSFERS	52.3	50.1	42.0	43.5	22.0	19.3	32.7	37.5	20.3	16.7	23.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
GROSS GENERAL REVENUE (in millions of dollars)	471.8	114.0	628.7	562.6	5734.2	6359.6	837.8	729.4	1453.9	1878.8	18771.0

¹Includes statutory subsidies, share of federal income tax on privately-owned public power utilities, share of federal tax on undistributed income, share of federal estate tax, grants under the Established Programs (Interim Arrangements) Act, Quebec Youth Allowances, Canada Student Loans and Yukon and Northwest Territories operating grants.

²Includes transfers for general government, protection of persons and property, transportation and communications, health, social welfare, natural resources, agriculture, trade and industry and tourism, environment, recreation and culture, labour, employment and immigration, housing, supervision and development of regions and localities, research establishments.

Source: Statistics Canada, *Provincial Government Finance, 1972*. Ottawa: Information Canada, 1975. Derived from Table 1.

The Impact of Federal Transfers on Provincial Revenues

Before discussing future prospects for the federal role in financing education, we should evaluate the general impact of federal transfer payments on provincial revenue structures. This is particularly necessary if we are to assess the entire federal impact on the financing of elementary and secondary schooling since, as we have shown, direct federal spending for elementary and secondary education makes up less than five per cent of the total.

In 1972, 76.3% of the Gross General Revenue of all ten provinces came from their own sources, including the provinces' share of income taxes collected on their behalf by the federal government (see Table 6). The remaining 23.7% came primarily from federal transfer payments (23.5%; an insignificant 0.2% was contributed by local governments). Approximately two-thirds of the federal transfer (15.8% of provincial gross general revenue) was for specific purposes. The remainder (7.6% of provincial gross revenues) was general purpose, mainly equalization grants. The relative importance, by province, of the federal transfers varies considerably. It makes up 52% of total revenue in Newfoundland, only 19% in Ontario. Most specific-purpose transfers are distributed under shared-cost formulas. The general-purpose transfers are equalizing. Most of the federal payments received by the so-called "have" provinces (Ontario, Alberta and British Columbia) are specific purpose.

In Table 7 we examine these transfers on a per capita basis and relate them to national average values. Provincial revenue from their own sources amounted to an average of \$657 per capita in 1972, total federal transfers increased this amount by \$203 per capita and local transfers added another \$2, to yield on average gross provincial revenue per capita of \$862. It will be seen that the federal transfers had an equalizing effect. For example, the coefficient of variation based on per capita revenue from own sources was 18.9%. After the addition of all transfers it was reduced to 7.5%.

Future Prospects for the Federal Role in Financing Education

There can be no doubt that federal transfer payments to the provinces (in particular, the general purpose equalization payments) have had a substantial equalizing effect on the per capita resources of provinces and on their per pupil spending for elementary and secondary schooling. Greater equality of per pupil expenditure surely must have had a positive impact on the goal of greater equality of educational opportunity, however it is defined. Therefore, the advantage of a greater federal direct financing role seem undeniable. But the present state of federal-provincial fiscal relations make the prospects for specific federal transfers for public schooling very slim indeed. Current population trends*, recent developments in school finance, and federal-provincial fiscal arrangements on social welfare measures which affect the home environment may combine to create brighter prospects for achieving greater educational equality than we have ever had in the past. Certainly, stable or declining enrollments will improve the prospects for a more equitable distribution of educational resources. And the trend toward provincewide financing enhances educational equality within the province. However, the most promising development has been the broadening of the base for equalization grants under the Federal-Provincial Fiscal Arrangement Act.

*Outline by Dr. Szigmond of Statistics Canada, in the companion paper to this one, given at the Canadian session of the San Francisco conference, 1975.

TABLE 7 ESTIMATED IMPACT OF TRANSFER PAYMENTS ON
PROVINCIAL REVENUE, 1972

Province	From Own Sources	Federal Transfers			Total ¹	Total Transfers ²	Gross General Revenue
		General Purpose	Specific Purpose				
			Education	Total			
A. REVENUE PER CAPITA (in dollars)							
Nfld.	423	239	29	225	464	464	887
P.E.I.	504	232	38	273	505	505	1009
N.S.	459	157	29	176	333	333	792
N.B.	495	182	15	198	380	381	876
Que.	739	119	33	84	205	208	946
Ont.	656	6	2	150	156	157	813
Man.	569	95	33	178	273	276	845
Sask.	497	150	18	146	297	299	796
Alta.	700	14	33	165	179	178	878
B.C.	696	3	9	128	131	140	836
All Provinces	657	66	26	136	203	205	862
Index of Dispersion (%) ³	18.9	70.6	48.0	28.8	40.7	41.1	7.5
B. PERCENTAGE OF NATIONAL AVERAGE (PER CAPITA)							
Nfld.	64.4	362.1	111.5	165.4	228.6	226.3	102.9
P.E.I.	76.7	351.5	146.2	200.7	248.8	246.3	117.1
N.S.	69.9	237.9	111.5	129.4	164.0	162.4	91.9
N.B.	75.3	275.8	57.7	145.6	187.2	185.9	101.6
Que.	112.5	180.3	126.9	61.8	101.0	101.5	109.7
Ont.	99.9	9.1	7.7	110.3	76.9	76.6	94.3
Man.	86.6	143.9	126.9	130.9	134.5	134.6	98.0
Sask.	75.7	227.3	69.2	107.4	146.3	145.9	92.3
Alta.	106.5	21.2	126.9	121.3	88.2	86.8	101.9
B.C.	105.9	4.6	34.6	94.1	64.5	68.3	97.0
All Provinces	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹Includes proceeds from federal government enterprise as follows: Newfoundland, \$58,000; Quebec, \$15,805,000.

²Includes transfers from local governments.

³Coefficient of Variation.

Source: Same as Table 6.

As early as 1957, the Canadian Government began to make unconditional tax revenue equalization payments to the provinces with the object of better enabling them to provide comparable levels of services for comparable levels of taxation. Originally, the payments brought the per capita yield of three (so-called) standard taxes—personal income, corporate income and succession duties—up to the weighted average per capita yield of these taxes when levied at “standard” rates in Ontario and British Columbia, the two provinces with the highest per capita yields. When the federal-provincial fiscal arrangements were re-negotiated in 1962 a measure of natural resources revenue was introduced into the equalization formula, but the level to which revenues would be equalized was reduced from the average of the top two provinces to the average of the nation. One year later, for the balance of the 1962-67 Agreement, the formula reverted to the “top two” basis but with a mandatory deduction for provinces with above-average per capita yields from natural resources.

In 1967 a major change occurred in the equalization formula. The tax base used to determine equalization entitlement was broadened to include 16 sources of provincial revenue instead of the four covered by the previous agreement. The formula attempts to measure the amount by which each province’s per capita revenues (calculated using a “representative tax system”) would fall short of the national average. Then equalization payments ensure that the province can receive revenue equal to the national per capita average, regardless of the deficiencies in its own revenue sources and without subjecting its taxpayers to above average tax rates.

In the fiscal arrangements for the period 1972-77, the 1967 equalization formula was expanded to include 19 sources of provincial revenue. The three added sources were health insurance premiums (based on the weighted number of taxable income tax returns), race track taxes (based on amounts wagered at pari-mutuel tracks), and the provincial share of income tax on power utilities (based on actual federal payments to the provinces). In 1973 an important amendment was made when municipal taxes for education were added to the equalization base. It is estimated that this change added \$171.3 million to the equalization entitlements of the seven recipient provinces in 1974-75, bringing their total entitlement to \$1,733 million. Although we hoped that this addition to the equalization formula would result in net additional funds available for public schools, the Minister of Finance, in introducing the measure, expressed the hope that the transfers would be used to provide relief to local taxpayers.

While it is a welcome step to have local as well as provincial revenue-raising capacity recognized in the equalization formula, in a system of unconditional grants it is anomalous to restrict it to those local taxes earmarked for a specific purpose.³ A logical extension of the formula would have been to include all local taxes. This probably was rejected primarily on grounds of cost. It has been estimated that if the remaining 60% of local tax revenues had been included in the equalization base, it would have increased the equalization costs to two-and-one-half times that which was actually incurred in 1974/75. The inclusion of local school taxes in the formula raises a host of theoretical and practical issues—issues which centre on the fact that, in the absence of uniform property assessments among the provinces, the equalization formula uses the total funds actually raised rather than the tax base. But regardless of whether or not the formula is extended to include all sources of local tax revenue, unconditional grants should increase very rapidly in the two remaining years of the current fiscal arrangement. The soaring prices of crude oil have resulted in a dramatic increase in the revenues of the oil producing

provinces, Alberta in particular. Despite the fact that the Minister of Finance has indicated that only one-third of the additional revenue due to the world oil situation will be equalized, it is clear that the additional equalization to be shared by all the "have not" provinces, except Saskatchewan, in 1975 alone would be approximately \$300 million. Revenue equalization transfers already have done much to mitigate the extreme differences in the relative financial positions of provinces and, indirectly, have helped reduce inter-provincial differences in expenditure per pupil. Since most of the provinces are eager to obtain these politically costless equalization dollars (in preference to specific purpose transfers) and Quebec adamantly refuses the specific grants in any case, the future prospects for *specific* federal transfers for elementary and secondary schooling are very uncertain.

The weakness of the trend toward greater revenue equalization is that it denies the federal government the possibility of pursuing any national purpose in education. It cannot encourage a national educational goal—such as, for example, the extension of pre-school education. Moreover, equalization focuses on revenues, without consideration of differences in real or program needs or in unit costs. Comparison of the percentage of personal income spent on elementary and secondary education among the provinces reveals that part of the reduction in provincial differences in spending per pupil has been achieved by greater financial effort in the less prosperous provinces. In 1972, four of the provinces which fell below the national average on most measures of fiscal capacity per capita made greater than national average (5.9%) effort in providing support for public schools: Newfoundland (6.3%); Prince Edward Island (6.8%); Quebec (6.2%) and Saskatchewan (6.8%). Only Alberta among the "have" provinces exceeded the national average by spending 6.5% of total personal income on their public schools, and part of the explanation for this may be that that province makes large capital expenditures out of current revenue. Although, at the moment, specific federal grants for elementary and secondary education may not be politically feasible, in the future it may be possible to achieve much the same effect by introducing refinements into the revenue equalizing formula, ones which will take account of interprovincial differences in fiscal need.

We shall end this paper with some brief comments about the federal program of support for post-secondary education, which in Canada is also a provincial responsibility. Direct federal financial assistance to Canadian universities began in 1945 with the Veteran's Rehabilitation Act which permitted over 50,000 World War II veterans to attend universities. The universities received a direct subsidy of \$150 per year for each veteran enrolled and financial assistance toward the construction costs of new buildings and facilities. With the inevitable decline in the number of veterans enrolled, about 1950, the universities began to experience renewed financial difficulties. In response the federal government introduced a grant based on the formula of fifty cents per capita provincial population, and distributed within the province on the basis of each university's share of provincial full-time enrollment. The universities welcomed this unconditional assistance, but it was regarded as an unconstitutional federal intrusion on a provincial area of responsibility and it caused friction between the provincial governments and Ottawa. In fact, Quebec instructed its universities to refuse the grants. The problem was not resolved until 1959 when arrangements were introduced to permit contracting or "opting out". *De facto* these arrangements permitted Quebec to obtain conditional federal grants without meeting any conditions. By the mid 1960s opting out had been extended to virtually all shared-cost programs for Quebec and, so that it was clear that Quebec did not enjoy a special status, the same arrangements were offered to the other provinces.

By 1966-67 the university grants had reached \$5 per capita provincial populations and during the sixteen years of their existence had provided Canadian universities with \$400 million. In 1967, federal assistance to universities was incorporated into the federal-provincial fiscal arrangements. The specific grants to universities were replaced by the federal government's abatement in favour of the provinces of four equalized points of federal personal income tax and one equalized point of corporate profits. In popular terms the federal government "surrendered" tax points to the provincial governments.

Because of differences in provincial yields (even after application of the equalization formula) and in provincial levels of spending for post-secondary education, it was felt necessary to bring the total tax transfer to each province up to an amount equal to 50% of the operating costs of all post-secondary institutions in the province.* An alternative formula based on \$15 per capita of provincial population was provided for the low-income provinces. As a result of the new policy of fiscal transfers and adjustment payments, between 1966 and 1967 the total federal contribution to provinces jumped from \$99 to \$422 million. In the first five years of this program federal fiscal transfers increased from \$422 to \$922 million.

While the 1972-77 fiscal arrangements were being negotiated, the federal government agreed to continue its existing program for two more years but placed a limit of 15% per annum on the growth of payments to the provinces. In 1973 it extended the program till the end of the arrangements agreement (i.e. March 31, 1977).

However, it is no secret that the federal government would like to change the "open ended" nature of many shared cost programs. Particularly it wishes to change the basis of its support for post-secondary education. Not only is there dissatisfaction with the rapid growth in total costs, but also with the pattern of distribution among the provinces. Because of its cost-sharing feature, the richer provinces have benefited well from the program, because they can afford their share of the investment. In addition, the rich provinces have well established post-secondary programs so they have been able to take full advantage of the scheme from the outset. Although there has been a great improvement in the money total granted, compared to the former direct grants to universities, the distribution of federal post-secondary transfers has become progressively more inequitable (at least on a per capita basis) between the different provinces. In the first year of the program the per capita transfer varied from \$15 (the guaranteed minimum) in Newfoundland, Prince Edward Island and New Brunswick to \$27 in Alberta. The spread in dollars per capita had widened by 1973-74 to between \$35 and \$56 and the trend will probably continue.

Conclusion

To summarize: in the Canadian federation although education is a provincial responsibility federal financial arrangements have had an impact on provincial educational systems. The effect has been less direct on elementary and secondary school systems than on post secondary institutions. This is due, in large part, to the type of policy vehicle used to effect the transfer. The current trend is away from specific grants, toward ever greater use of general fiscal transfers, with the policy result that it is virtually impossible to directly affect national educational goals.

*i.e. of universities, technical institutes, community colleges and other post-secondary institutions for training students beyond junior matriculation level.

REFERENCES

1. For an excellent analysis of alternative measures of fiscal capacity see Advisory Commission on Intergovernmental Relations, *Measures of State and Local Fiscal Capacity and Tax Effort*. A Staff Report, Washington Government Printing Office, 1962. Designated hereinafter as ACIR Report, M-16.
2. Walter Hettich, Barry Lacombe and Max Von Zur-Muehlen, *Basic Goals and the Financing of Education*. Ottawa: Canadian Teachers' Federation, 1972, p. 30.
3. For the argument to support this view, see James A. Maxwell and George E. Carter, "Equalizing Local Government Revenues", *Canadian Tax Journal*, July-August, 1974. pp. 397-405.

THE A-95 REVIEW: ITS ROLE IN EDUCATION PLANNING

The A-95 review is a procedure for coordinating federally assisted programs and projects with each other and with state, regional, and local plans and programs. At present, there appears to be little awareness by school officials of the intent and operation of the A-95 review. This article will describe the process and the Project Notification Review System (PNRS) which New York state has implemented in order to comply with the federal A-95 requirements.

What is an A-95?

A-95 refers to the U.S. Office of Management and Budget Circular A-95, the intent of which is to "furnish guidance to federal agencies for cooperation with state and local governments and the evaluation, review and coordination of federal assistance programs and projects" (*Federal Register*, 40, October 10, 1975, 47960b). This circular was published early in 1971. It then became the responsibility of individual states to develop a procedure to implement the circular's intent. New York state developed a procedure called the Project Notification Review System (PNRS) whose purpose is threefold: to establish a project notification review system that will facilitate coordinated planning on an inter-governmental basis; to provide for coordination of federal development programs and projects with the planning efforts of the state, the region and the local community; and to obtain comments and views upon proposed projects that can be forwarded to the funding agency. In New York state, federal project applicants are required to notify both the state and area-wide clearinghouses when applying for federal funds which come under A-95 review.

Although the process has been functioning for several years, its impact is only now beginning to be felt by those applying for federal funds. Each year an increased number of programs are listed as being subject to the jurisdiction of A-95. Only recently have certain education programs fallen into this category. (Figure 1 shows a list of current ones.) If school district officials have been applying to education agencies for funding, it is quite possible that already they have had experience in dealing with the A-95 process and are familiar with the PNRS System. In many cases, however, it represents another bureaucratic hurdle for the local school official preparing a proposal for funding. Although efforts have been made by federal and state agencies to disseminate information regarding this new process, there still exists considerable confusion and not all are aware of the purpose of PNRS.

The list of programs under A-95 is growing rapidly. It is expected that by mid-1976 all federal domestic programs for providing financial assistance which can have impact on area or community development will be covered. This will include many (if not most) education programs. The best way to determine if a program is currently subject to A-95 review is to consult the *Catalog of Federal Domestic Assistance* which is issued annually, with amendments made during the year, and is sold on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office. Reference should always be

*Project Director and Planner, Southern Tier West Education Project, Salamanca, New York.

FIGURE 1 FEDERAL PROGRAMS (EDUCATION) UNDER A-95 REVIEW

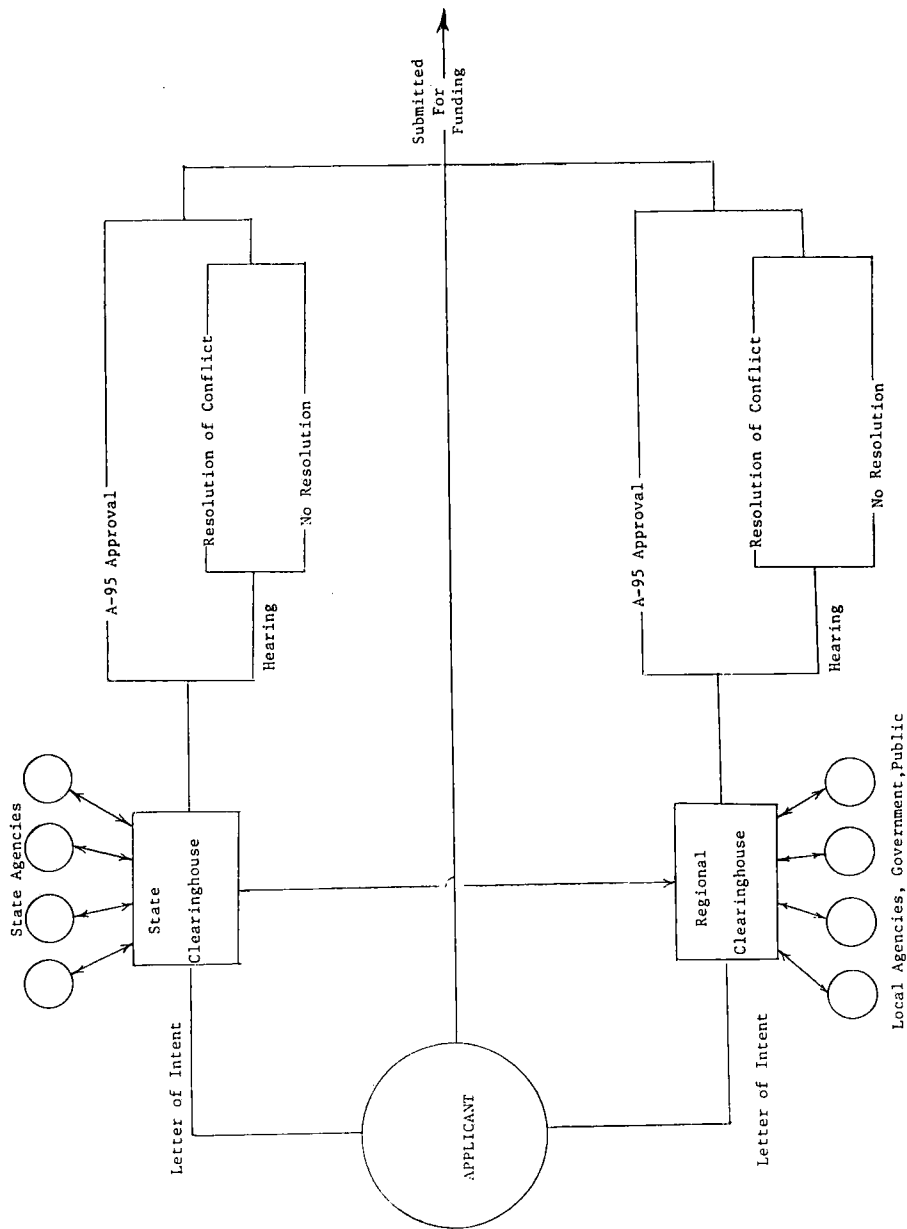
13.340	Health Professions Teaching Facilities—Construction Grants
13.369	Nursing School Construction
13.378	Health Professions Teaching Facilities—Loan Guarantees and Interest Subsidies
13.400	Adult Education—Grants to States
13.401	Adult Education—Special Projects
13.408	Construction of Public Libraries
13.421	Educational Personnel Training Grants—Career Opportunities
13.427	Educationally Deprived Children—Handicapped
13.428	Educationally Deprived Children—Local Educational Agencies
13.429	Educationally Deprived Children—Migrants
13.433	Follow Through
13.464	Library Services—Grants for Public Libraries
13.477	School Assistance in Federally Affected Areas—Construction
13.493	Vocational Education—Basic Grants to States
13.494	Vocational Education—Consumer and Homemaking
13.495	Vocational Education—Cooperative Education
13.499	Vocational Education—Special Needs
13.502	Vocational Education—Innovation
13.516	Supplementary Education Centers and Services—Special Programs and Projects
13.519	Supplementary Educational Centers and Services; Guidance, Counseling, and Testing (PACE)
13.520	Special Programs for Children with Specific Learning Disabilities
13.522	Environmental Education
13.543	Educational Opportunity Centers
13.600	Child Development—Head Start
23.002	Appalachian Supplements to Federal Grants-in-Aid (Basic grants only)
23.012	Appalachian Vocational Education Facilities and Operations
23.016	Appalachian Vocational Education and Technical Education Demonstration Grants

made to the appendix amendment which bears the latest issue date. Ultimately, the most authoritative source regarding A-95 applicability is the funding agency itself. The onus of responsibility is on the grant applicant to be aware of, and follow, all application procedures.

Figure 2 graphically depicts the A-95 review process as it is carried out in New York State.

Copies of the one page letter of intent for review of an application for a federal grant or loan (in New York State the PNRS forms) are forwarded to both state and area-wide clearinghouses. The term “clearinghouse” accurately reflects the function of these agencies, which is to identify and clarify relationships between the project and the state or area-wide comprehensive plan. The clearinghouse itself does not approve or disapprove an application. It merely defines the relationship which the proposed project holds to current and future plans or programs of the particular state and/or local authorities (educational and other).

Figure 2 THE A-95 REVIEW PROCESS IN NEW YORK STATE



The procedure involves the following steps:

- The grant applicant files a PNRS letter of intent with the state and regional clearinghouse simultaneously. The state clearinghouse reviews the letter for any statewide implications, circulates it for comment to other interested state agencies and then forwards a copy to the appropriate regional clearinghouse.
- Comments usually are solicited from agencies that have similar or supportive roles in the subject area of requested funding.
- If the comments express concern, the regional clearinghouse may request a meeting between itself, the applicant, and the other interested parties. At this time the applicant may decide to modify the proposal or clarify certain aspects of it.
- Whether or not such modification takes place, within thirty days of receiving the letter of intent, the regional clearinghouse forwards a letter to the applicant reporting any comments (positive or negative) and the results of any meetings held. The applicant must include these letters with the final grant application.

Is the System Working?

Local education agencies frequently ask whether the A-95 process is effective or whether it is just another bureaucratic stumbling block. It must be admitted that the process is still in its developmental stages, and that it has been accompanied by much confusion. There have been misconceptions as to the role which state and regional clearinghouses should play. Most of the problems are attributable to a breakdown in communication between school district administrators, the officials of the state education department, and the clearinghouses personnel. To the school officials, the regional clearinghouses seem to have been given considerable power to determine the allocation of federal grant monies, although they do not have sufficient expertise and familiarity with the education sector. Such a perception is unfounded. The clearinghouse does not approve or disapprove funding. It has little direct power. It is true that sometimes, because of lack of expertise, its staff fail to ask the pertinent questions. Although few regional clearinghouses have staff who are *solely* responsible for educational planning, all should have personnel who are aware of the educational agencies operating within their region and they should forward copies of letters of intent to the appropriate agencies for review and comment. If the system is working properly, the clearinghouse should be in a position to report whether similar programs are already in operation in the region, to suggest how two applicants can supplement rather than duplicate each other's operations, or how an applicant can cooperate with an existing program.

Recently we participated in the process and our experience illustrates its pros and cons. One of the region's Boards of Cooperative Educational Services (BOCES) had submitted a series of grant applications which would support a number of occupational programs at the BOCES center. The regional A-95 clearinghouse, at which our offices are located, sent letters soliciting comments to representative regional and county Manpower Training Programs, which are sponsored by the U.S. Department of Labor, and to local trade union leaders. The response of the Director of Manpower Training Programs suggested that there was a possible duplication of effort in their programs and the BOCES' programs, both of which would be supported with public funds. The clearinghouse called a meeting to determine whether, in fact, duplication of effort did exist, and if so, how the problem could be solved. At the meeting it became obvious that the Manpower

Training Program was planning to offer similar occupational training programs within its budget for the next fiscal year. It was also obvious that poor communication existed between the BOCES Occupational Education Director and the Director of the Regional Manpower Consortium. As a result of the meeting, it was agreed that the Manpower Program could utilize BOCES' occupation education courses and facilities for their clientele, on a pay-as-you-go basis. The meeting had served one of its purposes in establishing a valuable communication linkage, but the primary purpose of pre-screening requests for federal funding had not been served. At its close the BOCES Occupational Education director said, "You know, this meeting was not really necessary. We received our funding approval a week ago".

The BOCES Occupational Education Director had not been aware of the A-95 requirement in his grant application. After the grant application process was well underway, someone noted that the A-95 forms were missing. When he was informed of this requirement the BOCES Occupational Director submitted the A-95 forms "after-the-fact". The State Education Department disregarded the lack of the A-95 review form and awarded the grant. Fortunately, a potential problem was revealed and dealt with by the meeting sponsored by the area-wide clearinghouse, even though the A-95 review was by that time merely a formality.

Since many federal agencies, particularly those dealing with education, assign funds to the state as a block grant, rather than as individual grants to local education agencies, the local officials look to the state departments of education for project information and project approval. Both state and local personnel, accustomed to working through traditional channels, find themselves facing a new procedure. The A-95 requirement introduces another dimension to proposal developments and applications. This new dimension, regional-level participation in educational planning, is not always automatically or fully supported by all personnel at the various levels of the review process. Some of this is due to inertia and reluctance to change, some to disapproval of the change. State Education Department officials may feel that their position in the review process has been usurped by another agency; they may perceive the involvement of the regional-based clearinghouse as merely an annoyance or a threat to the state's traditional role in disbursing federal dollars. As time passes, state education departments may come to recognize, as a result of working with these local review agencies that the review and allocation procedure has gained a unique local perspective through the A-95 process.

Area-wide clearinghouses will also have to recognize that local education agencies might well try to exert undue pressure in support of their proposals. The fact that the State Education Department no longer is the sole reviewer of education projects in no way should suggest that a local education agency should be parochial in its approach to program development. This would be contrary to the intent of the A-95 review process. Local education agencies should welcome the opportunity to enjoy the financial and program quality benefits which intra-regional and inter-regional cooperation can offer. They have a tendency to feel that they themselves can do a particular job best. In the past they have been lukewarm in embracing the concept of regional cooperation. These factors have been a barrier to the ultimate success of the A-95 project review process. However, as the process develops, its advantages become more apparent.

On the other hand, the area-wide clearinghouse must also take care to avoid becoming insular. The soliciting of comments from agencies and sources representing widely varied interests and perspectives is its prime function. To fulfil it successfully it must

avoid taking an adversary role towards different educational agencies, or taking sides between the State Education Department and the local education agency.

Is the System Necessary?

If properly administered at all stages, the A-95 process cannot but help strengthen the planning of educational programs, both at the local and state levels. The immediate beneficial results are:

- Lines of communication will be developed which allow for an increased flow of information between education agencies and between educational and non-educational authorities.
- Both the local and the state education agency will be able to perceive their programs in relation to overall planning within a given geographic region.
- Education agencies should become more responsive to the needs of the total social spectrum.
- A local perspective should become part of the evaluation of applications at the federal level, thereby making federal funding more responsive to needs.

Education officials should encourage the state and area-wide clearinghouses to involve them in the A-95 process. If a letter soliciting comment on a project is received it should not be disregarded; it should be answered by a supporting or critical letter backed up by appropriate comments. All members of the education community accept a general responsibility to contribute to the quality of education in their region or state. The A-95 process provides the means of making this more than just a 'motherhood' statement—by responding to letters soliciting comment, or by submitting the letter of intent *in the spirit* in which OMB circular A-95 was written. Accountability is the key concept underlying this process. An organization applying for tax based funds not only is accountable to its constituents but also to its professional counterparts. Perhaps A-95 started out as yet another bureaucratic hurdle, but it can be used for other purposes. If supported, encouraged, cultivated and refined it can become a useful coordinating device, one sorely needed for macro-planning.

REVIEWS

A review of four* volumes, *Comprehensive Planning in Education*, State of New Jersey Bureau of Planning, Trenton, New Jersey. Volume 1. *Comprehensive Planning in Education*. April 1975; 2. *Goal Development in Education*. August 1974; 3. *Needs Assessment in Education*. December 1974; and 7. *Planning Bibliography*. June 1975.

It is difficult to review an incomplete group of documents which are intended to be a total package. However, in this instance each of the four volumes reviewed should be able to stand independently and not lose its impact when separated from the rest. We shall first assess the total package (to date) and then each volume.

Planning is defined by the authors of *Comprehensive Planning*, as "The process of developing alternative means of achieving goals and objectives". They stress that the process is designed to "...assist decision-makers in determining educational policy" and that the assistance is to the school district. These handbooks, therefore, are primarily for those who are planning for local school districts in countries with a form of educational authority comparable to the de-centralized structure in the United States. They are not addressed to planners at either the state or national levels of educational administration. The processes reported here were developed by the New Jersey Bureau of Planning for use in New Jersey, and they have been tested in local school districts of that state. Unfortunately there is very little data to show the extent of testing carried out, or the size and complexity of the districts in which testing took place.

With the title "Comprehensive Planning" one would expect the handbooks to deal with the total field of educational planning for a local district but, both in the volumes reviewed here and in those proposed, the emphasis is solely on planning for program development. One might perhaps view this as an attempt to redress previous imbalance. Finally we have authors who neglect structure or policy planning, facilities planning and financial planning. But neither "group" is acceptable as comprehensive. We would prefer to use a title of "comprehensive" to mean just that. We suspect that some readers will be led astray when they read the title and will be disappointed in what might have been a useful set of handbooks.

Since these documents are designed to help local school district personnel it would be helpful to know precisely to whom they are addressed—the local principal, the superintendent, the planner? The authors indicate that "... initial approval [for a needs assessment] should come from the administration". Initiation of a formal needs assessment must be authorized by the senior administration of the district. It could not be successfully conducted without their awareness and approval. Furthermore, in view of the authors' support for involvement of the community in the process, surely the board of school trustees' approval should also be sought! It is irresponsible to approach a community on a matter such as needs assessment without the clear approval of their duly elected educational policy representatives. In our opinion insufficient emphasis has been placed on the role of the board.

In general the books provide a useful guide to local officials to whom they are directed—if they are totally ignorant of educational planning. However, there is a disturbing unevenness in the quality of presentation. Volume 3 is the best developed, volume 1 the least.

Volume 1. *Comprehensive Planning for Education*

This book begins with a call for more effective planning prior to any program change and provides a simple rationale for planning. In the large school district, the authors call for a planning unit with a full-time planner, but otherwise the unit is not defined. They suggest that in smaller regions, planning be carried out by a superintendent. In a later volume** it is suggested that the planning office be staffed by a trained planner or a task force of untrained lay and educational personnel. We doubt that such advisors could provide sufficient guidance for the development of a real planning capability

*Of a proposed set of seven.

**Volume 2, p. 45.

REVIEWS

It is even questionable whether one single well trained planner would have the technical expertise to conduct extensive planning activity. With such an inadequate investment in personnel, the need to employ consultants would be extensive. It would have been helpful in developing *Comprehensive Planning* if the authors had been specific in describing the structure, personnel and skills needed in a planning unit and had related these needs closely to the size of districts.

A second major shortfall of this book is that the concept of community involvement is not developed. The authors clearly favour extended involvement of the public in the planning process (as does this reviewer) but little rationale is presented for it. And the pitfalls of involving the public are not adequately addressed either here or in Volume 2. The authors assume positive value in community involvement but many of the educational establishment would not agree wholeheartedly with their position. Therefore, the handbook should provide the reader with clear indications of the problems that may be encountered as well as the means to overcome them. It fails to do this.

The authors consider that the planning process is composed of eight elements. (1) Goal development, i.e., "What should be?" is to be based on public participation, as has been noted. The handbook notes some of the problems involved in parental participation – willingness to commit sufficient time, language problems, and the representativeness of participants – but neglects other problem areas. (2) Needs assessment, defined as "Where are we now?" shows clearly the difference between perceived and actual need. However, there is no comment on the relative merits of informed and uninformed perception and how to deal with the latter. Without solving the major problem, i.e., how to resolve variability in the priorities of different individuals, the authors call for a priority ranking of goals. (3) Problem analysis is dealt with simply as employing "... a variant of the 'force field' technique"" and a brief explanation of the actors is included. (4) In the generation of alternatives, it is suggested that "goals and programs for solutions" be quickly eliminated. It does not seem appropriate when little or no examination of data specific to those alternative programs has taken place, to eliminate them early during the generation phase. The development of data collection procedures and actual data collection appear to be a significant omission from the model, particularly since (5) involves selection of alternatives. While data collection may be implicit in the conduct of a needs assessment or in problem analysis it would also be related solely to the choice of one or other alternatives and it cannot proceed until the alternatives are defined. (6) Implementation frequently is omitted from models such as these, so it is refreshing to see that implementation strategies are recognized as a significant element in the model. The inclusion of evaluation (7) merely as an "evaluation component" is inadequate in a planning handbook which calls itself "comprehensive". Criteria and procedures for evaluation surely must be defined *during* planning process to ensure that the goals established will be those upon which evaluation will proceed. The concept of recycling (8) is of course implicit in the concept of planning as a recurring activity. There are few today who consider "the plan" as the end product of planning.

Volume 1 seems to be just too brief to provide the needed overview for the series. The introduction and glossary are useful to explain planning terms, particularly for administrators with an inadequate planning background. However, there should have been a much more complete outline of the model to be employed, with discussion of its underlying assumptions, so that the implications of using some of its elements and neglecting others would become clear to the reader.

Volume 2. *Goal Development in Education*

This book begins with various definitions of goals and clarification of the differences between process goals and outcome goals. While such definitions are helpful they do not show how goals should be stated – although they do provide a number of examples of appropriate goal statements. We have already mentioned, although the authors support community involvement in the development of educational goals, they neglect to point out issues which should be considered before the community-derived goal procedure is accepted and used. Obviously they just assume that the reader agrees with community-derived goals, knows about the possible complications and does not need to be reminded of necessary cautions.

Three models of goal development processes are outlined, the conference, the interview and the survey. The authors have designed and field tested all three. Unfortunately the presentation of the models is very uneven which may result in expectations of ease of application that are unwarranted. The authors seem to feel that the interview technique requires the least advice and the conference the most. In our opinion this is doubtful. Both techniques are generally poorly executed. The authors

present their material on conferences in five well developed pages and add three more on the leadership process, two on news releases and two on group discussion. Description of the use of the interview is given only two pages (although it is true that some parts of the appendix apply equally well to the interview as to the conference).

The discussion of conference preparation includes some rather insignificant details while major areas of concern, e.g., the training of group leaders,* is given too brief a treatment. However, on the whole, this is one section which has been effectively carried out. It may be that much of the material on the use of conferences and interviews to generate goal consensus for educational planning was so familiar to the writers that they do not consider it needs discussion. Or they may expect local boards to use experienced consultants anyway. When arriving at a consensus, those opinions which were expressed by only 24% of participants are to be rejected. For us, this advice arouses concern. How is minority opinion to be taken into account if such a rejection device is used? We would not *expect* many minority opinions to command the adherence of 25% of a group.

We also must take issue with the authors' concept of the advisory council. The development of goals for a system must form a major part of the role of a board of education. It is curious that in a representative democracy an author would state that "a representative council is able to assess the community more realistically". If it is indeed the case that some sort of *ad hoc* community committee represents its varied interests better than its duly elected educational board then the democratic process is failing at its task. That is not to say that the board should not consult and enlist the assistance of its experts, its staff, its students and members of the community to develop the goals of the system, but that this function is inherent in the trustees' role. If not, there is no need for trustees.

The authors propose that the representative council should "... organize and conduct the goal development activities" and choose "the process" to be followed. Is such a council really competent to do this? One must have grave doubts about such competency when the authors feel the need to instruct the council members on how to take minutes of their meetings!

All in all, volume 2 is a fairly useful handbook but it lacks organization. Some parts are excellent but others need considerable revision.

Volume 3. *Needs Assessment in Education*

The purpose of this book is to present a rationale for the needs assessment, explain the results to be anticipated and outline the steps necessary to begin it. Four models developed in other jurisdictions are described, e.g., The Dallas model, the Fresno model, the Phi Delta Kappa model, and the Worldwide model. The book does not purport to develop models itself but it does offer the reader an excellent outline of these four. The overview is clear and easily understood. The presentation is precise and answers the initial questions of purpose, methods of operation, who is involved, outputs expected, costs (money and time) and the need for and availability of materials and resource personnel. The data are placed in a matrix for ease of comparison.

Each model is discussed by posing a series of questions: Who is involved? Is goal determination the first formal step in the process? How are needs assessed? How are goals determined? How are goals and needs converted into programs and policies? How is evaluation accomplished? What are the implementation factors? A flow model which puts each step in context and gives the definitions and key terms of each model is helpful. The appendix includes an easily followed evaluation process which might be used to determine whether the needs assessment was effective.

This is the most useful book of the four which were provided for review.

Volume 7. *Planning Bibliography*

The bibliography provides source materials on planning which may be of particular interest to educators in New Jersey and national (U.S.) sources for a wider range of readers. The rest of the book includes annotated bibliographical references from a wide range of sources. Each annotation is very brief but they provide sufficient information to enable the reader to decide whether the item will be of interest. Cross referencing of the materials and their classification into categories related to the

*An appendix is provided for this purpose but no reference to it is made in the text.

REVIEWS

New Jersey comprehensive planning model and other related areas of educational planning provide easy access to any particular item.

If any addition were to be made to this book there should be provided a listing of the publications which were indexed. This should prove to be a very useful reference for the practising educational planner.

In summary: The volumes in the series *Comprehensive Planning* which describe the specific elements or activities of the New Jersey planning model are likely to be of greater assistance to the local school board planner than those which deal with the concepts of planning generally or even with the conceptualization of their model itself. The first four volumes which we have seen do not present well organized documents that answer the questions a local planner must ask. The first volume is quite inadequate, perhaps because it is very brief. The series is worth reading but the books are disappointing. They will not provide the local school official with the directions one would expect from the title.

*Edward H. Humphreys**

*Associate Professor, Department of Educational Planning, OISE. Chairman of the Peel County Board of Education, Ontario.

A Special Message to Educational Planners

The Professional Institute is happy to offer two programmes to help you successfully plot your institution's future.

The programmes include only proven planning techniques that have worked time and again for a variety of educational organizations.

COLLEGE PLANNERS

December 13-17, 1976 Duke University Durham, North Carolina

This meeting focuses on how to do the right kind of planning . . . and how to keep your plans on target. The meeting will give college planners full coverage of NCHEM and the NEEDS System of plan monitoring.

SCHOOL SYSTEM PLANNERS

December 6-10, 1976 Duke University Durham, North Carolina

This meeting includes the most current thinking of scholars and researchers in planning. It's based on information gathered from hundreds of state commissioners, heads of regional service agencies, district superintendents. You will cover both operational and strategic planning.

Call Dan Hamm at 212-586-8100 or fill in the coupon below.



**THE PROFESSIONAL INSTITUTE OF
The American Management Associations**
135 West 50th St., New York, N. Y. 10020

YES. I'm interested in more information on the following meeting

- COLLEGE PLANNERS**
 SCHOOL SYSTEM PLANNERS

Name _____

Title _____

Institution _____

Address _____

Telephone _____

17-8683M

EDUCATIONAL PLANNING



Journal of the International Society of Educational Planners

Volume 3

Volume 3: Numbers 1, 2, 3 and 4

CONTENTS

ARTICLES, ADDRESS, EDITORIAL NOTE, ABSTRACT and REVIEW

- 1* 83 The A-95 review: its role in educational planning
- 1* 11 Backcasting from graduation targets to required enrollments using the generalized inverse of the transformation matrix
- 4* 12 Canadian children on the move: international and interprovincial migration in Canada
- 4* 81 The beginnings of educational planning in Surinam
- 4* 64 Conflict management as an integral part of university planning
- 3* 34 The continuing plan for public education in Mississippi
- 2* 39 Cost impact: a framework for the analysis of community college programs
- 2* 6 Critical issues in educational needs assessment
- 2* 73 Decision theory: an application to educational management
- 4* 1 The design of a future-oriented sensing system for the identification, production and dissemination of national educational information needs
- 2* 80 Designing a national system for development: the Sudanese experiment
- 1* 38 Economies of scale in the operation of public elementary schools
- 3* 103 Editorial note: Nashville conference papers
- 2* 1 Educational needs assessment: the state of the art
- 1* 46 Educational planning from taxonomic to transformative
- 3* 20 Evaluation as a component of the educational planning process: evaluation of a transferred Canadian technical institution, The Accra Technical Training Centre
- 3* 71 Fault Tree analysis as a planning and management tool: a case study
- 1* 22 Forecasting notes – II
- 4* 44 Forecasting notes – III – estimating the number of secondary school dropouts from a local school system
- 1* 1 Forecasting the movement of educational administrators through vacancy flows
- 1* 69 The impact of Canadian federal financial arrangements on provincial educational systems
- 1* 58 Managing policy development in public service organizations
- 2* 30 A model for setting realistic numerical goals for hiring minorities and women in a state university system

- 2 53 Multinomial logistic enrollment models: application to Iraqi primary education
- 2 16 Needs assessment conference: statements made on the panel on critical issues
- 2 20
- 3 58 A nondeterministic resource planning model in education
- 2 24 A note on the relative importance of subject matter goals and higher order goals
- 3 65 Overcoming barriers in cooperative decision making
- 2 90 Perspectives on educational planning
- 3 37 Planning and practice in U.S. education
- 4 26 Planning for staff development
- 3 1 The President's address
- 4 34 The process of change: revisiting general premises of politicized adaptation
- 2 66 Project simu-school component, Washington State University
- 3 44 Proposition development, cross-impact analysis and futures history as a prologue to long-range planning
- 4 72 Schools for developing countries: the Turkish village institutes
- 3 52 South Carolina: statewide assessment of educational needs
- 3 11 Strategy planning for education in Florida: a case study in organization and method
- 3 86 Student evaluation of instructional performance: a continuing dilemma
- 4 60 The use of participation rates in educational planning

REVIEW

- 1 89 State of New Jersey Bureau of Planning, *Comprehensive Planning in Education*,
 Vol. 1 *Comprehensive Planning in Education*
 Vol. 2 *Goal Development in Education*
 Vol. 3 *Needs Assessment in Education*
 Vol. 7 *Planning Bibliography*

ABSTRACT

- 3 103 Comprehensive multi-level planning: a home grown process

CONTRIBUTORS TO THIS VOLUME

Robert M. Alworth	4	60	A.P. Johnston	3	44
Diana J. Ashworth	3	52	Stephen S. Kaagan	1	58
J. Jackson Barnette	4	1	Pacharee Kraprayoon	2	30
Frank W. Banghart	2	30	Ramesh C. Kumar	4	44
Alfred E. Bender	2	20	Edwin Marshall	4	81
Lawrence Bezeau	1	11	James K. Martin	2	39
Edward J. Blakely	2	80	Robert L. Mitten	1	38
Ron Brandt	4	26	Bruce Morton	1	83
Daniel J. Brown	1	1	Bernard Novick	3	103
Wilfred J. Brown	1	69	Susan Padro	2 39, 4	44
Bruce S. Cooper	2	90	Dan R. Quarles	3	86
K. Fred Daniel	3	11	Mohammad A.A. Shami	2	24
Betty Dillon	4	26	C. Lloyd Shubert	3	65
Kenneth J. Dyl	1	83	Bobby Stacy	3	34
Fenwick English	2	16	C. Kenneth Tanner	2	73
William Evanco	2	53	Gayle Davis Thornton	2	73
Judith Freed	4	60	Geoffrey A. Tully	2	30
Edgar A. Fresen	3	11	Molly T. Vogt	4	64
Thomas E. Glass	2	66	Cicely Watson	1 22, 3 1, 4	44
John L. Hayman Jr.	4	1	Howard E. Wakefield	3	37
Martin Hershkowitz	2	6, 24	Janice J. Weinman	1	58
Charles E. Hess	2	80	David K. Wiles	4	34
Edward H. Humphreys	1	89	David N. Wilson	3	20
E. Dan Inbar	1	46	Belle Ruth Witkin	2 1, 3	71
R.W.B. Jackson	4	12	Omer Yilmaz	4	72
Gary P. Johnson	1	38	Koji Yoda	3	58

Educational Policy-making and Planning in a Small Centralised Democracy

DAN E. INBAR

Introduction

Any article on educational policy which focuses on a whole country as its case study is vulnerable to overgeneralisation and simplification. Nevertheless it is done. The main rationale for this is derived from the assumption that, beyond the almost countless variables that are in constant interaction in any given system, some basic important trends characterise it. Furthermore, these trends are assumed to dominate the stream of events and thus be a major factor in analysing and explaining some of the system's behaviour. Our main object is to obtain insight into the interactive process of three major components which yield interesting policy-making and planning (PMP) behaviour. The three components dealt with here are: first, the way the educational system is organised and power and authority are divided; secondly, the size of the educational system; and third, the type of value system and political orientation of the country. In the Israeli case these may be characterised as *centralised, small and democratic*.

Each of these components tends to emphasise different policy-making and planning (PMP) characteristics. Our main argument is that the combination of these three components which make up a unique national PMP environment yield a PMP process which still contains many of the characteristics of each separate component, but the configuration of the characteristics produces an unexpectedly unique national behaviour in educational PMP [1].

It turns out that small size and centralisation have dialectic features. By themselves they are closely coupled with rational and comprehensive PMP activities [2]. But combined with democracy, the same characteristics take a different turn and, instead of the predicted and proclaimed rational and comprehensive orientation, a new type of planning behaviour emerges which will be termed the *enlightenment* PMP approach.

How can we explain the transformation of the expected rational-comprehensive approach to PMP into the 'enlightenment' process? How does the 'enlightenment' process work and what are its characteristics?

Indeed, understanding this process is the underlying theme of this discussion. The analysis is based on the Israeli educational policy-making and planning case. The importance of this analysis, however, lies beyond the learning of the Israeli case. The attempt is to develop a conceptual frame of reference which might enable further comparative analysis of other small state educational systems.

The nature of this discussion is exploratory and not a data-based summary. Where data or previous studies exist they are mentioned to support the arguments. In some cases examples are given to illuminate the points discussed.

We will proceed with the discussion in the following manner: first, by elaborating on each of the three components and emphasising their PMP implications; second, progressing by analysing the components in pairs; and third, developing a combined analysis of the three components, leading to the understanding of the enlightenment process.

Centralisation

Rational-comprehensive planners prefer a government to have centralised decision-making [2]. This statement can easily be reversed. Centralised decision-making systems, as such, will tend to develop rational-comprehensive PMP processes. However, surely enough, centralisation, as a way of organisation, is not a sufficient condition to determine the PMP mode. One major determinant is the images a society holds. The more *holistic* the image of decision-makers and planners, the stronger the tendency to be engaged in rational-comprehensive planning [3].

The Israeli educational system is indeed a centralised organisation combined with an holistic set of images [4]. Five main centralisational features of the Israeli educational system having direct bearing on PMP may be exemplified. First, *administration* is basically centralised, with a strong bureaucracy located in Jerusalem around the Ministry of Education, headed by a Minister and run by the Director-General, with a central budgetary and planning unit. Secondly, there is the perception of highly centralised *policy-making* and development of educational goals, including a centralised curriculum with declared national goals [5]. Thirdly, there is the perception of an authoritative centralised *control system* through the superintendency and supervisory network. Fourthly, all major *inputs* are centralised—teacher recruitment, salaries and curriculum development. Fifthly, there is a tendency towards an objective process of *evaluation* through national minimum tests, on the one hand, and national matriculation examinations, on the other, which in the long run form an indirect competitive control system.

Everything else being constant, a powerful, centralised administration with nearly total control on inputs and perceived to be the major determinant of policy-making and evaluation would point to the almost inevitable development of a comprehensive educational PMP orientation [6].

Small Size

Undoubtedly, in terms of national educational systems, the Israeli system can be considered small. Comprising about 2000 elementary and secondary schools altogether, almost all of them within a two- to three-hour drive from Jerusalem, there is the feeling that one can *comprehend* the whole system, or at least a large segment of it [7].

There is a high degree of *familiarity* with the system on the part of the central authorities which strengthens their perception of *knowledgeability*. This familiarity with the system, by knowing most of the central educational figures, all the superintendents, most of the supervisors, many of the secondary school principals (probably all those heading big schools), and numerous elementary school principals and teachers, and by being involved and having experienced problems on all levels, gives the central authorities the feeling of running a *manageable* system, and gives the impression of controllability. Furthermore, knowledge and control reduce the perceived *uncertainty*. Consequently, assuming the relative precision of information and projections and assuming a high degree of control over events tends to emphasise not only rational PMP processes but comprehensive long-range policies and plans as well [8].

Centralisation—Small Size

The combination of a highly centralised and small country can be expected to yield comprehensive PMP processes initiated and implemented by the central educational authorities [9]. In addition, we might expect the central authorities to have considerable and direct involvement at all the stages and levels, even in relatively specific details. This leads to a centralised, step-by-step allocation of resources which links funding to control efforts [10]. All these aspects can be discerned in the Israeli educational system. There is a central department in the Ministry of Education for budgeting and planning; a central department of curriculum planning; basic educational changes or plans were holistically comprehended. Because they are in office for a relatively extended time, with a rather low rate of intersectorial mobility, the central authorities become very familiar indeed with the educational system; and this, combined with the relative ease of accessibility, increases their direct involvement in educational affairs.

The Educational Reform (restructuring the educational system from an 8-4 system to a 6-3-3 one [11]) was centrally planned, with centrally controlled resource allocation for the entire nation. The project of 'Planning for the Eighties' [12] was initiated, carried out (the planning stage) and summarised by the Director-General of the Ministry of Education. Similarly, the Welfare Programme, aimed at helping communities with a high proportion of disadvantaged pupils, was initiated, planned and implemented centrally. In all these major PMP activities in the past two decades, the central authorities in general and the Director-General and Minister of Education himself in particular were deeply involved in all stages.

The PMP in a small environment, although on a national level, is related to a perception of controllability, although it is often only an illusion [13]. Even when projects are locally implemented, the resources are allocated step-by-step by centralised budgeting. This means some centralised control at all times, through the re-evaluation of project progress at each step and allocation of new funds accordingly.

Such centralised evaluative processes are found in other major educational areas as well. The matriculation examinations are carried out and evaluated centrally. The same is true for tests of the gifted and minimum competency tests.

Democracy

We have no intention here of analysing the whole relationship between democracy, the various approaches to policy-making, planning and decision-making. This has been done extensively elsewhere [14]. We will emphasise, though, four major aspects which are of importance to our analysis: the communication-information dimension, pluralism, the balance of power, and the process of consensual legitimation.

Communication and information. Open communication lines are fundamental in the Israeli political and administrative system. People have the right and the ability to communicate with top officials at various levels of government in general and in the educational system in particular. Although there is no one specific law to ensure this public right and access to information, the strength of the independent newspapers and the accumulation of juristic precedents ensure that right; all of which implies that the Israeli educational system can be characterised as a two-way, open communication system.

Pluralism. Although Israel is considered a country of Jewish immigration, attempting to crystallise a unified nation [15], its pluralistic nature, culturally and politically, is also seen as one of its basic characteristics. Planning in a pluralistic structure, in the context of a socio-political consensus which is conditioned by a social-democratic ideology, tends to be

more an enhancement of "social choice, by identifying options, rather than a mode of decision-making" [16]. However, the crystallisation of a Jewish state as a basic ideology in the country, on the one hand, and the boundaries of choice inherent in any centralised planning system on the other, mould the trends towards unification in the educational system.

This double trend of pluralism and unification can be seen clearly in the educational system. The 1953 National Education Act was intended to unify and to prevent the politicisation of pluralism. However, the right of parents to promote 25% of school programmes, the various Jewish religious educational systems, and the near-autonomy of the kibbutz school system are clear examples of the pluralistic trend [17].

The balance of power. Despite the danger of overgeneralisation, it is quite safe to state that one of the major features of the Israeli political system is its delicate balance of power. On the national political level, this is expressed in the fragile governmental coalition and the many political parties represented in the Knesset, the Israeli Parliament. However, this is true at the local level, too, where most city and town governments are also based on very delicately balanced coalitions, in many cases formed as part of a national agreement. Since education is considered one of the more important issues in society, it is coupled, to a great extent, with the political system. Consequently, sensitive and important educational issues quickly become part of the political arena, and local issues are easily consigned to the national political level [18].

Consensual legitimisation. The legitimised pluralistic character of Israeli society, with its political reflection expressed in the delicate balance of power, leads to a continual effort to reach a national consensus on important issues [19]. Such an effort is reflected not only in the need for a broader consensus in order to obtain parliamentary approval but also in the involvement of the public in major issues [20]. This can be seen by the establishment of public committees composed of national figures and professionals for major decisions; for instance: the Public Examination Committee on the Needs and possibilities of Extending Compulsory, Free Education (1965), whose recommendations were the basis for the comprehensive educational reform started in 1969; the Prime Minister's Commission for Children and Youth in Distress (1973), which laid down basic policies on this subject still implemented in part today; and the Public Examination Committee for Israeli Educational Reform (1979), which analysed the situation after ten years of educational reform, based on various evaluation studies (where some of the committee members took part in the studies). Another example is the National Examination Committee for Teacher Status and the Teaching Profession (1979), whose recommendations serve as basic guidelines for determining teacher salaries. Even if a committee's recommendations are not fully implemented by the authorities, on the one hand they still serve as a powerful means of increasing national consensus on sensitive issues such as educational reform, but on the other also serve as justification for firm confrontation by interest groups such as the teachers' unions.

The configuration of these four features of the Israeli democracy characterise an active society, developing interest groups, and political organisations which are deeply involved in social issues in general and in educational issues in particular, well informed and constantly utilising the whole communication network. Furthermore, the tendency to seek social consensus and the delicate balance of power increases the potential power of each of these groups.

Disjointed incrementalist planning [21], independent planning agencies, and local programmes which reflect the pluralistic character of a country could be expected if democracy is considered in isolation [22].

Centrality, Small Size and Democracy

Before turning to the main theme of the impact of the small centralised democracy on educational policy-making and planning, let us first highlight some of the basic characteristics derived from this configuration.

As Israel is a small country, practically all newspapers are distributed nationwide, and the same is true for radio and television broadcasting. Although there are four radio stations, news comes basically from one source, the Voice of Israel, the national broadcasting station; and one national television station covers the whole country. Hence, there are just a handful of journalists covering all educational issues for the whole country throughout the entire communications network.

The size of the country and its centralised political system mean that all local political networks are closely coupled to the central political system. There are virtually no isolated local political problems. Most local programmes and arrangements are centrally organised and assume national precedence. The size of the country, the close connection between the local and the central power bases, and the democratic open communications network make it easy for every local interest group to reach the central authorities directly. There is, furthermore, a national awareness of local interest groups, and a centralised effort to deal with them.

The main argument is that these characteristics affect the educational policy-making and planning mechanisms and then create what will be termed the 'enlightenment' process.

Insight into the Enlightenment Process

Policies are implied by the degree of central operational involvement in everyday problems. Through everyday involvement, discussions, emphasis on policy declarations, and the development of centralised control of projects, policy is diffused. The emphasis here is not on what is known to be an incremental approach to policy-making, reflected in its step-by-step approach, its short-range decision-making or short-term planning. What is suggested here is to apply the conceptual frame developed by Weiss [23] but to reverse its direction. Still, the original term will be applied and this process will be viewed as an 'enlightenment' process.

The original concept referred to its application in the sociology of knowledge, concentrating on the complex phenomenon of the effect of social-science research on public policy-making, where it refers to the process in which research is diffused upwards to the policy-making echelon. Here the emphasis is on the policy-making process itself and the way educational policies affect the educational system. The focus is on the diffusion process of policies across the whole educational system.

Through the enlightenment process it is not a single decision nor even a body of related policy decisions which creates a policy and directly affects the system. Rather it is the perspective that involvement, negotiations, argumentation and compromise have engendered that permeates the policy-making process. Policies and plans are diffused circuitously through manifold channels, and over time the main policy and planning orientations are shaped into a policy perspective. It would rarely be possible to cite one specific decision that determined a policy. It is not only the type of decision which carries the message; these compromise decisions might be far from official policies. The arguments, the contacts, the very discussions conducted through the continuous involvement which are the heart of the enlightenment process carry the policy's message. It is the opinions and arguments which diffuse the policy orientation more than the solutions themselves.

The notion of PMP as an enlightenment mode has a comforting quality. It assumes a

process of shaping policies and planning without direct confrontation with interest groups. The constant central involvement in educational problems, the continual informal contacts with public opinion 'gate-keepers', become an efficient means of non-confrontational influence. Who are these 'gate-keepers'? what are some of the basic characteristics of the enlightenment process?

For the purpose of clarity, the analysis will be based on a sequential series of characteristics. However, the following analysis does not imply an unequivocal linear chain of causality. Social reality is more a series of interactions and the analysis could thus depart from a different point as well.

Inner Circle of Power

When PMP is based on an enlightenment process, emphasising personal contacts, communication and professional committees, those who can influence will gain power and those who have power will influence. Professional status, political power, close relationships with the authorities, and easy access will be basic determinants of establishing the influential power group [24].

In other words, we are talking of an educational inner circle of power (EICP) which can be seen as the heart of the enlightenment process. The EICP includes top educational administrators, academicians, public figures, teachers' union representatives, and politicians who have known each other for a long time, and because of the small size of the country they have constant opportunity of keeping in touch. The EICP does not have any formal status and the members do not necessarily share the same educational policies. However, they are involved either in initiating PMP processes or in initiating or participating in educational research studies and evaluation. As an illuminating example, when the news media require a personal interview, for instance, one or more EICP members will be chosen. Similarly, public or professional committees will either be headed by or composed of mainly EICP members.

To what degree is this EICP stable? Although it might be premature to quantify at this point the degree of EICP change over the years, it seems to be very stable, in spite of the changes among the Ministers themselves. If, during the first 29 years of statehood (1948-1977) the Israeli Ministers of Education were drawn only from the Labour Party, one could argue that the enlightenment process seemed 'natural'. The educational milieu did not change. However, even during the years between 1977-1984, when for the first time the Minister of Education came from a different political party (a religious one at that, instead of the Labour Party), the same enlightenment pattern of PMP continued.

During the first years of this new political orientation in the Ministry, no radical changes could be monitored. The same familiar patterns continued. However, almost without conflict, some basic policies were changed. For instance, the implementation of the Educational Reform for more social integration [25] was slowed down almost to a standstill. This did not happen without public debate or professional committees, but was part of the pattern. On looking back, it is possible to see how the message of a new policy has slowly penetrated the educational system, with new curricula and more emphasis on religious studies, etc. It took several years before the EICP started to change, with top educational officials, new professional members, and new public 'gate-keepers'. Indeed, since the changes in the EICP have become dominant and visible, much more attention has been paid to accumulating changes in educational policy. Now, when the Minister of Education is again from the Labour Party, the EICP is starting to be reshaped. Although the 'old' members are trying to retain their influence, it seems that in the reshaping process a new

generation is becoming involved. It will be interesting to see if and how new educational policies will be shaped.

Nationalisation of Local Problems

In a small, centralised democracy, virtually no serious or important educational problems can be isolated. There is a national echo in local problems, i.e. a tendency to nationalise local problems. This can be seen through three interrelated processes. First, the Ministry of Education, through its top official staff, including the Director-General and the Minister of Education himself, feel an obligation to be knowledgeable and in control of all major educational problems. Furthermore, they have the feeling of being able to do so. Indeed, in many cases it is almost impossible to solve the problem without central involvement.

Secondly, any effort to develop direct contacts between local participants and the central authorities is legitimate. And on top of it, all participants have the practical opportunity to contact even the uppermost echelons of the educational system. Either they know the necessary people personally through common personal history, or have contemporary professional relationships. Others, especially the local authorities, can reach central attention through political connections, when the sensitive national balance of power is often dependent upon the solution of local problems.

Thirdly, since any meaningful communications network is national, every local educational problem brought to the attention of the media moves directly into the national arena. Once a local problem hits the news, it becomes a national issue calling the attention of the public and of all national political centres.

In a small pluralistic democracy with strong teachers' unions and a nationwide parents' association and local politicised interest groups, regular educational problems very quickly reach the national agenda. As an illuminating example we can take the 1 September, the starting day of the academic year. This is one of the tensest days for the Director-General and the Minister of Education. On the national evening television news there is a quite detailed account of almost every problem occurring on the first day. If a second-grade class in a remote town had problems—parents' claims against the teachers, for example—it becomes national news. In Acco, a small town in the northern part of the country, there were bussing problems at the start of the 1984 academic year. It went through political channels and only the involvement of the Director-General solved the problem. A more extreme case can be seen in the attempt to close a school in a Tel Aviv neighbourhood and send the children to other schools close by. The project involved the teachers' union and turned out to be a major national educational problem. The Knesset (the Israeli Parliament) became involved and professional committees were formed, including the Director-General. The issue became part of the local election issues and needed the highest authorities, the city mayor and the Minister of Education to reach a compromise solution.

Operative Involvement

In these circumstances the central authorities will be preoccupied with problem-solving rather than with long-range thinking and planning. However, it would be wrong to assume that central PMP is diminished. In a centralised system, long-range thinking and planning is the approach which was and still is preferred [26] by the Ministry of Education. But continuous involvement in burning problems—local problems—and the endless effort to maintain the educational system's integrity finally make *operative involvement* the main mode of organisational behaviour. Long-range plans are drawn up but not translated into

operative programmes. Over-involvement is indeed a matter of major concern when the system is engaged in a continuous effort to maintain the balance between social pressure and central obligation [27].

Such emphasis on centralised involvement is derived not only from the obligation to be involved or from the pressure imposed on the authorities, but also from the impression that the central authorities indeed have *control* and detailed information to deal with problems. Educational issues are mainly 'wicked' by nature [28]; and, consequently, we read a situation of *fallacy of certainty*. The combination of centralisation and (small) size reinforces the temptation for the central authorities to handle projects centrally and to become involved in relatively minor or local problems. However, it almost always turns out that the problems are more complicated than previously thought, and the central authorities' capabilities do not always correlate with the problem or project's complications, which make compromises inevitable. The point is that the central authorities are almost doomed to become involved. They feel obliged to do so, are pressured to do so; and all parties feel that they are capable of doing so.

It is exactly this type of accumulative involvement which characterises the Israeli mode of educational policy-making and planning.

Mediation and Manipulation

From an operative viewpoint what types of role do the Minister of Education and the Director-General play in their everyday work? In such an established enlightenment process, with a strong power circle and short communication lines open to constant pressure, the Minister and the Director-General have difficult roles. It seems that their roles run somewhere between being intermediaries (trying to compromise among pressures) and being manipulators (attempting to reshape opinions and invite pressures, thus neutralising contradictory pressures, and implementing minor decisions—thus forcing a certain chain of events). Again, everyday management becomes more of a process of indirect influence and accumulations of compromises and manipulative actions than unequivocal decisions of policy. This correlates with the argument that planning is not just a matter of expertise or a rational procedure but rather a political activity determined by power relations. Hence planning is highly characterised as a mediating process between conflicts [29].

Diversification and Dramatisation

The legitimisation of pressure, the short communication lines and the assumption of central responsibility effectively produce constant pressure on the Ministry to solve educational problems. Since this situation forces national solutions to local or specific problems, when compromise is the dominant procedure [30], the result is a highly *diversified* educational system. This means that within the basically centralised system so-called 'temporary' solutions are established. They may take the shape of projects, experiments or special programmes which are generally institutionalised, thus becoming part of the educational system [31].

If diversification was functional as long as resources were available, in a period of scarce resources it is not. Then the establishment of priorities seems almost inevitable. However, the basic characteristics of the system (communication, central responsibility, legitimisation of pressure) impose boundaries to the possibility of establishing priorities for resource allocation. Hence, scarce resources are distributed across the whole system in the

same basic proportion. Budget cuts are carried out in the same manner—proportional cuts across the whole system.

On the assumption that policies depend partly on the configuration of the communication channels at decision points [32], the following argument will be developed. If communication lines are open, demands and pressures are legitimate and central involvement is almost always expected, an overload of demands and pressures will be an inevitable consequence. In this situation demands just do not get through; or, when they get through, the pressure is beyond the centre's capability. In such cases, a process of problem dramatisation can be observed. Problems are dramatised in order to get national attention either through the national newspapers or through the most effective channel, the national television. Reaching the TV does not promise a quick solution, but it does promise getting the central authorities' attention, as well as parliamentary attention [33]. Let us illuminate this point with another example. In the beginning of the 1985 academic year a boy was expelled from school for disciplinary reasons. Parents disagreed with the school principal and other authorities. After several days, the case hit prime-time national TV news and the Director-General himself appeared on the screen.

Similarly, delegations are quickly organised and immediately knock on the Director-General's door or even approach the Minister directly. In these processes, members of the EICP are activated to open, first of all, direct communication lines and, secondly, to produce more pressure. Local strikes by teachers and parents, and national teachers' strikes which are too common in the Israeli educational arena can be partially explained through the need to dramatise.

Summary

The main argument of this paper is threefold. First, the basic physical and socio-political environment (in this case country size, organisational setting and type of political structure) is a basic determinant in the process of educational policy-making, planning and implementation. Some insights have been offered in order to give a better understanding of how this process takes place. Secondly, the interaction of the basic characteristics changes some of the expectations related to each characteristic. For instance, the combination of democracy and centralisation shifts the emphasis from system control towards an obligation to respond to the system. Third (and this is the main argument) the combination of the three components—centralisation, small size, democracy—creates a new configuration which implies a different setting in which policy-making and planning do not constitute a direct, clear decision-making process, but rather an enlightenment process whereby policy and planning are implied and influenced. Policy messages are transmitted mainly through the process of involvement and negotiation, and not directly through the accumulation of decisions as implied by a disjointed incremental approach to planning.

The size of the country makes continual personal contact possible at all levels of the system; it establishes an inner circle of power; and it makes central involvement possible in local and specific problems. Democracy legitimises personal contacts and keeps communication lines open. Small size and democracy facilitate direct pressure and the nationalisation of local or specific problems. Centralisation as such forces central involvement and responsibility; but centralisation combined with small size encourages an increase in local expectations of central involvement in almost every practical problem. Even when authority is delegated in an attempt to decentralise, the tendency will be to develop direct contacts with the higher central authorities. The educational inner circle of power functions as a central part in the dual process of enlightenment—a significant inward channel for research

outcomes, ideas and pressure and an important outward channel for the diffusion of educational policy.

The study of educational policy-making and planning on a national level may be analysed by using various approaches [34], each yielding different variables. Yet the choice of the three variables dealt with here—size, organisational mode and political value system—is derived from the assumption that combined they reflect a specific PMP milieu. The idea was to gain insight into the PMP process in such a milieu, thus offering some generalisations for a more challenging comparative study.

NOTES

- [1] On the importance of planning environment as a basic determinant of planning styles, see F.F. RABINOVITZ (1969) *City Politics and Planning* (New York, Atherton Press). She went further to develop six planning styles as a function of local (city) environments. For a comparative analysis of patterns of educational planning in 75 countries as related to their national environment, see D. INBAR (1973) Organizational patterns of educational patterns, *Comparative Education*, 9, pp. 73–89.
- [2] ANDREAS FALUDI (1973) *Planning Theory* (Oxford, Pergamon Press).
- [3] M.E. OLSEN (1968) *The Process of Social Organization* (New York, Holt, Rinehart & Winston).
- [4] For a comprehensive analysis of the Israeli educational system, see A.F. KLEINBERGER (1969) *Society, Schools and Progress in Israel* (Oxford, Pergamon Press).
- [5] For a thorough historical analysis of the development of the Israeli educational policy-making system, see R. ELBOIM-DROR (1985) Educational policy making in Israel, in: W. ACKERMAN, A. CARMAN & D. ZUCKER (Eds) *Education in an Evolving Society*, pp. 35–116 (H) (Jerusalem, Van Leer Institute).
- [6] ALBERT WATERSTON (1965) *Development Planning: lessons of experience* (Baltimore, Johns Hopkins Press).
- [7] Small size as a country's analytical determinant is utilised in several studies. On economic sociological and demographic aspects, see BURTON BENEDICT (Ed.) (1967) *Problems of Smaller Territories* (London, Athlone Press), where there are also some case studies of small states. For other case studies of small states, emphasizing ethnic aspects, see STEPHANIE NEUMAN (Ed.) (1976) *Small States and Segmental Societies* (New York, Praeger). For problem-oriented analysis of small states, see J. RAPOPORT, E. MUTEBE & J.Y. THERETHIL (1971) *Small States and Territories* (New York, U.S. Institute for Training and Research, ARNO Press).
- [8] We emphasised the perceptual aspect of smallness since there is substantial evidence to show that small states face unusual difficulties in planning, RAPOPORT *et al.* (1971), *op. cit.*
- [9] Compare to the concept of multiplanning agency, in: Y. DROR (1971) *Ventures in Policy Science* (Amsterdam, Elsevier) and strategic planning agency, in: ANDREAS FALUDI (1973), *op. cit.*
- [10] N.S. GLASSMAN (1985) Funding and control linkage in education, in: E. BEN-BARUCH & Y. NEUMAN (Eds) (1985) *Studies in Educational Administration and Policy Making: the case of Israel*, pp. 135–160 (Herzlia, Unipress Academic).
- [11] D. INBAR (1981) The Israeli educational reform: the paradox of feasible planning, *Comparative Educational Review*, 25, pp. 13–27.
- [12] E. PELED (1976) *Israeli Education in the Eighties* (Jerusalem, Ministry of Education).
- [13] Kalcheim challenges the widely held belief that local freedom is eroded by central control. See CHAIM KALCHEIM (1980) The limited effectiveness of central government control over local government, *Planning and Administration*, 7, pp. 76–86.
- [14] K. MANNHEIM (1949) *Man and Society in an Age of Reconstruction* (New York, Harcourt); E.S. REDFORD (1969) *Democracy in the Administrative State* (New York, Oxford University Press); R.A. DAHL (1970) *A Preface to Democratic Theory* (Chicago, University of Chicago Press); P. BIRNBAUM, J. LIVELY & G. PARRY (Eds) (1978) *Democracy, Consensus and Social Contract* (London, Sage), Modern Politics Series, Vol. 2; G. DUNCAN (Ed.) (1983) *Democratic Theory and Practice* (London, Cambridge University Press); LIJPHART AREND (1984) *Democracies: patterns of majoritarian and consensus* (New Haven, Yale University Press); FRANK HEARN (1985) Durkheim's political sociology: corporation, state autonomy and democracy, *Social Research*, 52, pp. 151–161.
- [15] CHAIM ADLER (1969) Education and the integration of immigrants in Israel, *International Migration Review*, 3, pp. 3–19.
- [16] DAVID LUNDBERG (1976) Pluralist organization and consensus in Swedish planning, *Long Range Planning*, 9, pp. 69–79.
- [17] For a general analysis of pluralism in a democratic society, see M.M. TUMIN & W. PLOTCH (1977) *Pluralism in a Democratic Society* (New York, Praeger). For an empirical examination of 18 plural societies, see A.

- ROBUSHKA & K. SHEPLE (1972) *Politics in Plural Societies: a theory of democratic instability* (Columbus, Ohio, Merrill).
- [18] On major models of power distributions in democracies and their implications for decision-making, see R.A. DAHL (1970), *op. cit.*
- [19] ALAN ARIAN (1971) *Consensus in Israel* (New York, General Learning Press).
- [20] For a study of the interaction between planning and consensus in a small country (the Danish case), see C.J. SKOVSGAARD (1982) Danish planning and consensus politics, in: D.M. RAY (Ed.) *Planning and Politics in Western Europe* (Basingstoke, Macmillan).
- [21] C.E. LINDBLUM (1959) The science of muddling through, *Public Administrative Review*, 19, pp. 79–80; D. BRAYBROOKE & C.E. LINDBLUM (1963) *A Strategy of Decision: policy evaluation as a social process* (New York, Free Press).
- [22] ANDREAS FALUDI (1973), *op. cit.*, p. 200; for some empirical support for the relationship between democracy and disjoint-incrementalistic planning, and centralised systems and rational-comprehensive planning, see D. INBAR (1973), *op. cit.*
- [23] CAROL H. WEISS (1979) The many meanings of research utilization, *Public Administrative Review*, September/October 1979, pp. 426–431; CAROL H. WEISS (1980) *Social Science and Decision Making* (New York, Columbia University Press).
- [24] Compare with F.F. RABINOVITZ (1969), *op. cit.*, executive-centred system.
- [25] M. CHEN, A. LEWY & C. ALDER (1977) *Process and Outcomes in Education: the evaluation of the contribution of the middle school to the educational system* (Jerusalem, School of Education, Tel Aviv University and The Hebrew University); D. INBAR (1981), *op. cit.*; YEHUDA AMIR & S. SHARAN (Eds) (1984) *School Desegregation* (New Jersey, Lawrence Erlbaum).
- [26] JOSEPH YONAI (1985) Changes in the role of educational policy formation of the pedagogical secretariat, Ministry of Education and Culture, *Ph.D. dissertation*, Hebrew University of Jerusalem.
- [27] Compare to R.R. GRAUHAN & W. STRUDEL (1971) Political rationality reconsidered, *Policy Science*, 2, pp. 249–270; analysis about the conflict between opening a full range of choice and the inherent structural tendencies to bound the range of choice.
- [28] H.W.J. RITTLE & M.M. WEBBER (1973) Dilemmas in a general theory of planning, *Policy Science*, 4, pp. 155–169.
- [29] ANDREW BLOWERS Much ado about nothing: a case study of planning and power, in: P. HEALEY, G. MCDUGALL & M.J. THOMAS (Eds) (1982) *Planning Theory Prospects for the 1980s* (Oxford, Pergamon Press).
- [30] R. ELBOIM-DROR (1970) Some characteristics of the education policy formation system, *Policy Science*, 1, pp. 231–253.
- [31] See P. DIESING (1962) *Reason in Society* (Urbana, Ill., University of Illinois Press) on this issue; analysis of the system's constant effort to balance between diversification and unification.
- [32] K.W. DEUTCH (1966) *The Nerve of Government—models of political communication and control* (New York, Macmillan).
- [33] R. ELBOIM-DROR (1981) Policy-making in the educational committee of the Israeli Parliament, unpublished paper (Jerusalem, School of Education, Hebrew University).
- [34] For two comprehensive reviews of policy and planning research, see C.C. YEAKY, Emerging policy research in educational research and decision-making, in: E.W. GORDON (Ed.) (1983) *Review of Research in Education*, Ch. 7, pp. 255–301 (Washington, D.C., American Educational Research Association); P.D. LYNCH & M. TASON (1984) Research on educational planning: an international perspective, in: E.W. GORDON (Ed.) (1984) *Review of Research in Education*, Ch. 8, pp. 307–367 (Washington, D.C., American Educational Research Association).

The International Society of Educational Planners

President: Kenneth Tanner, University of Tennessee
Vice-President and
President Elect:
Past President: Cicely Watson, Ontario Institute for Studies in Education, University of Toronto
Executive
Secretary/Treasurer: Bernard Kaplan, Syracuse University Research Corporation
Board Members: Lee Boone, Department of Education, Alabama
Manuel Bravo, Director-General, National Productivity Center, Mexico
Joe Farrell, The Ontario Institute for Studies in Education
Paul Masoner, University of Pittsburgh
Kay Palmer, Nevada Department of Education
Mark Scurrah, Department of Education, New York
Maureen Webster, Syracuse University Research Corporation
Belle Ruth Witkin, Alameda County School Board, California
David Harrison, Doctoral Student, University of Alabama

The Society was founded on December 10, 1970, in Washington, D.C. Over fifty local, state, national and international planners attended the first organizational meeting.

Since then its growth has demonstrated that there is need for a professional organization with educational planning as its exclusive concern.

Purpose

The ISEP was founded to foster the professional knowledge and interests of educational planners. Directly and indirectly it is also concerned with the state of the art of planning.

Activities

The activities of the Society are those of most professional associations: it publishes a newsletter and a journal, holds an annual conference, sponsors training workshops, conducts professional liaison with related organizations and encourages research.

Commissions

The Society currently has only one commission the chairman of which sits on the Board of Directors. Professor Don Adams of the University of Pittsburgh is the Chairman of the International Relations Committee.

The role of a commission is to advise the Board on an activity of continuing interest to the Society; it is expected that the number and interests of the commissions will change over time.

Membership

Regular Membership: residents of United States, Canada, Europe, New Zealand, Australia and Japan — \$20.00 residents of other countries — \$15.00
Student Membership — \$10.00 Institutional Membership — \$ 75.00
Sustaining Members — \$50.00

Send applications to the Secretary of the Society: Dr. Bernard Kaplan, Educational Policy Research Center at Syracuse, Merrill Lane, Syracuse, New York 13210.

