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ABSTRACT

The System for Trenton's Educational Planning (STEP), a set of procedures for strategic planning, is described. The background to the project and the desired goals which led to STEP are reviewed, and the major components of the annual planning cycle, including assessment, base case planning, policy formulation, project design, simulation of alternatives, and budget preparation are discussed. Summary explanations of the system's analytical models are given and estimates are made of the applicability of STEP to other potential users. (Author/LB)

SYSTEM FOR TRENTON'S EDUCATIONAL PLANNING (STEP):

A Computer-Based Approach to Realizing Community Goals

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Government Studies and Systems

INTRODUCTION

The goal of this presentation is to highlight the features of a computer-based comprehensive planning system for an urban school district. System for Trenton's Educational Planning (STEP) is now fully developed and is in its first year of implementation. Its impact on actual plan selection and budget determination will be felt this summer (1973) and reflected in the school district operating budget for 1974-75.

In this presentation, we will describe the background and goals of the project which led to STEP. In addition, we will describe the components of the annual planning cycle, and give summary explanations of the analytical models used in the system.

In the final sections we will make some estimates of the applicability of STEP to other potential users.

BACKGROUND TO THE SYSTEM

In the spring of 1970, many persons expressed a "felt need" for a sophisticated planning system in the Trenton Public Schools. Persons within the TPS organization, as well as persons from other civic and educational agencies which serve the Trenton community, agreed that, despite the many strengths of the district, it lacked a "comprehensive systems planning instrument for making policy decisions and allocating resources," that there was a need for a "meaningful" approach to involving organizations, parents, students, and teachers "in the making and implmentation of decisions regarding educational priorities," and that there was a need to organize the administration of this effort into a well-defined and adequately funded Office of Planning within the administration.

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The task force formed to analyze the need and develop a proposal, which consisted of representatives of TPS, the State Department of Education, Model Cities and other Community Agencies, as well as consulting firms which specialized in educational planning, developed specifications for the kind of system the district wanted. To summarize these "specs," it was decided that the final system would provide the Board and Executive Staff with the ability to:

1. Test the educational impact of various allocations of resources to continuing and new projects;
2. Develop plans that are directly related to educational activities;
3. Translate the plans into budgets, strongly supported by realistic estimates of the probable educational impact; and
4. Plan far enough into the future (five years) to achieve the program continuity needed to cope successfully with the educational problems of the district.

After considering various approaches to these goals, and after reviewing the credentials and proposals of several possible consultant-contractors, the Trenton Public Schools decided to employ Government Studies and Systems, Inc. as its system design group. The staff of GSS had recently completed the design and installation of a planning system in nearby Pennsbury, Pa., and TPS agreed that the Pennsbury model (EPPBS) would provide a reasonable starting point for the design of the Trenton Planning System, a system that would satisfy the specific needs of the Trenton community. To this end, GSS and TPS entered into a guaranteed performance agreement, wherein in each of the three years of the project, a portion of GSS payment was contingent on the delivery of specific system components - with a fully operational system as the Year 3 target.[1]

GSS, in addition, perceived the project as providing an opportunity to make at least two major improvements in its earlier system:

- first, to adapt its forecasting models to the complex economics and demography of the urban inner-city, and
- second, to amplify its ideas about goal-setting, and develop a goal-setting process suitable for a conflict-prone, heteregeneous community, in a way that would "democratize" somewhat the policy function.

THE SYSTEM: BASIC CONCEPTS

STEP is a set of procedures for strategic planning. In a school district, strategic planning is the process of deciding on the multi-year goals and objectives of the district, assigning priorities to the various goals and objectives (each with different costs and probable effects), and selecting that course of action which achieves the objectives in the least costly way. Thus, STEP relates what is spent to what is accomplished, resource inputs to educational outputs. The analyst, once he has developed a cost-effective plan, can increase output only by

[1] Government Studies and Systems, System for Trenton's Educational Planning (STEP): User's Manual, Trenton Public Schools, June 30, 1973. (Note: This work will be available through the ERIC Information System). Earlier Reports on the System may be found in ERIC ED 056 371 ED 056 372.

increasing input (money), and he can cut costs only by cutting the expected output of the district. In a sense, PPBS shows the Board and taxpayers what the community is getting for its monies, rather than what it is spending.

The users of STEP are investors of the public's money, rather than spenders. Each dollar committed will produce some return -- in this case, a change on the district's Indicators of Quality. (Those changes of expenditure caused by inflation will, of course, produce no change in return; "inflation" may be defined in this way.) The Board, moreover, will be able to choose among alternative budgets, each with different expected return as well as different costs.

The important theme that unites this description is the relationship between money and educational effectiveness. The most important difference between STEP planning and the many varieties of planning that formerly existed in TPS is that long-range educational and financial planning will be part of the same process. Until now, several factors militated against this unified process:

1. Educational and financial experts were relatively ignorant of each other's disciplines and needs.
2. Except for some Federal projects, there was no multi-year planning.
3. There was no specific goals in the district, and no clear criteria for evaluating the district or its programs. Thus, both educational and financial decisions were "evaluation-proof".
4. The budgeting format -- the "Handbook II Chart of Accounts" -- was nearly useless in making resource allocation decisions.

This last point cannot be overemphasized. J. Alan Thomas makes this point succinctly when he says:

> "These categories (the Handbook II accounts) are useful for descriptive purposes. However, they do not constitute useful breakdowns for the purpose of decision-making, since there is no way of relating the various inputs included in these categories to either programs or performance objectives. In fact, they may impede decision-making, by engaging boards and administrators in the partially irrelevant exercise of examining the manner in which resources are allocated among these categories. From the point of view of the school board member or layman who wishes to use the budget to inform him about the manner in which the system is allocating its resources, the....categories may appear to be developed for the purpose of concealing rather than revealing information." (2)

The obscurity of these budget accounts has engendered a peculiar style of budget decision-making in Trenton, and other, public schools. As Hartley puts it:

> "Local school budgets tend to be prepared in the 'incremental style,' which means that the primary basis for next year's budget is this year's budget. The major difference between the two is likely to be only an increase in each of the traditional categories of object of expenditure...little attempt is made to evaluate the various programs, or outputs, which are presumed to be supported by the budget." (1)

There is almost universal accord that the function-item budget format used in the Trenton Public Schools is virtually useless as a planning instrument -- whatever its merits as a cost-accounting system. Indeed, one of the most innovative aspects of STEP is that the determination of the detailed function-item budget for the next school year (Year 1 in the five-year plan) is done after all the important educational and financial decisions are completed. The operating budget will follow as a necessary consequence of the approved plan, instead of the reverse, which is now often the case.

In order, therefore, to attain a strategic planning capability, TPS requires the following elements associated generally with Planning-Programming-Budgeting Systems:

First, a system for setting measurable performance goals for the entire district; data about the success of the district in achieving these goals will constitute an evaluation of the district's resources will be determined by an explicit statement of the goals and their priorities.

Second, a program structure which divides the district organization into its real functional components -- not those described in the current budget accounts. These components will be called programs -- and be further divided into subprograms -- and each program will be responsible for achieving some part of the district's objectives. Further, for planning purposes, monies will be aggregated according to these programs, so that costs can be related to output on a program by program basis.

Third, a cost-benefit, or cost-utility model for making decisions, that is, a formal procedure for evaluating alternative plans before they are approved, and determining which gives the desired return at the best price.

In order to employ these elements of the planning system, several technological aids are essential:

- an information system to support planning
- an enrollment forecaster
- a revenue forecaster
- a cost and resource-requirements forecaster
- an output estimation procedure

THE SYSTEM: THE ANNUAL CYCLE

STEP: DETAIL LEVEL I

At the highest level of abstraction the flow of elements in STEP is as follows (See Figure 1):

Stage 1 - Assessment of current educational costs and benefits, and an updating of all those files necessary for operating the computerized elements in the planning system. The assessment is, thus, a collection of current facts, and also current ratios that will be used to generate forecasts of the future.

Stage 2 - The generation of the base case. After running assessment data through the system's forecasting procedures, a five-year forecast of what the school district's costs and benefits will be (if the previous year's plan is approved without change for the present planning period) is generated.

Stage 3 - Policy deliberation. The desired levels of school district effectiveness are reviewed, to set new objectives, priorities, and constraints, or to approve those previously developed; this determination involves a community opinionnaire survey.

Stage 4 - If any changes are required by the policy deliberation, the next stage is the design of projects intended to close the gaps between the expected levels of effectiveness in the base case and the desired levels; community groups participate in the project design activities.

Stage 5 - Various combinations of new projects are run through the forecasting models to generate alternative plans, each with a specified anticipated cost, level of output, and revenue requirements. Alternative plans are considered, and the most cost-beneficial plan for achieving the district's objectives is recommended for implementation.

Stage 6 - That plan which is approved by the Board of Education becomes the approved plan. (If the policy deliberation required no changes, the base case becomes the final plan.) The detailed budget proposal for Year 1 of the plan is generated at this point.

STEP: DETAIL LEVEL II

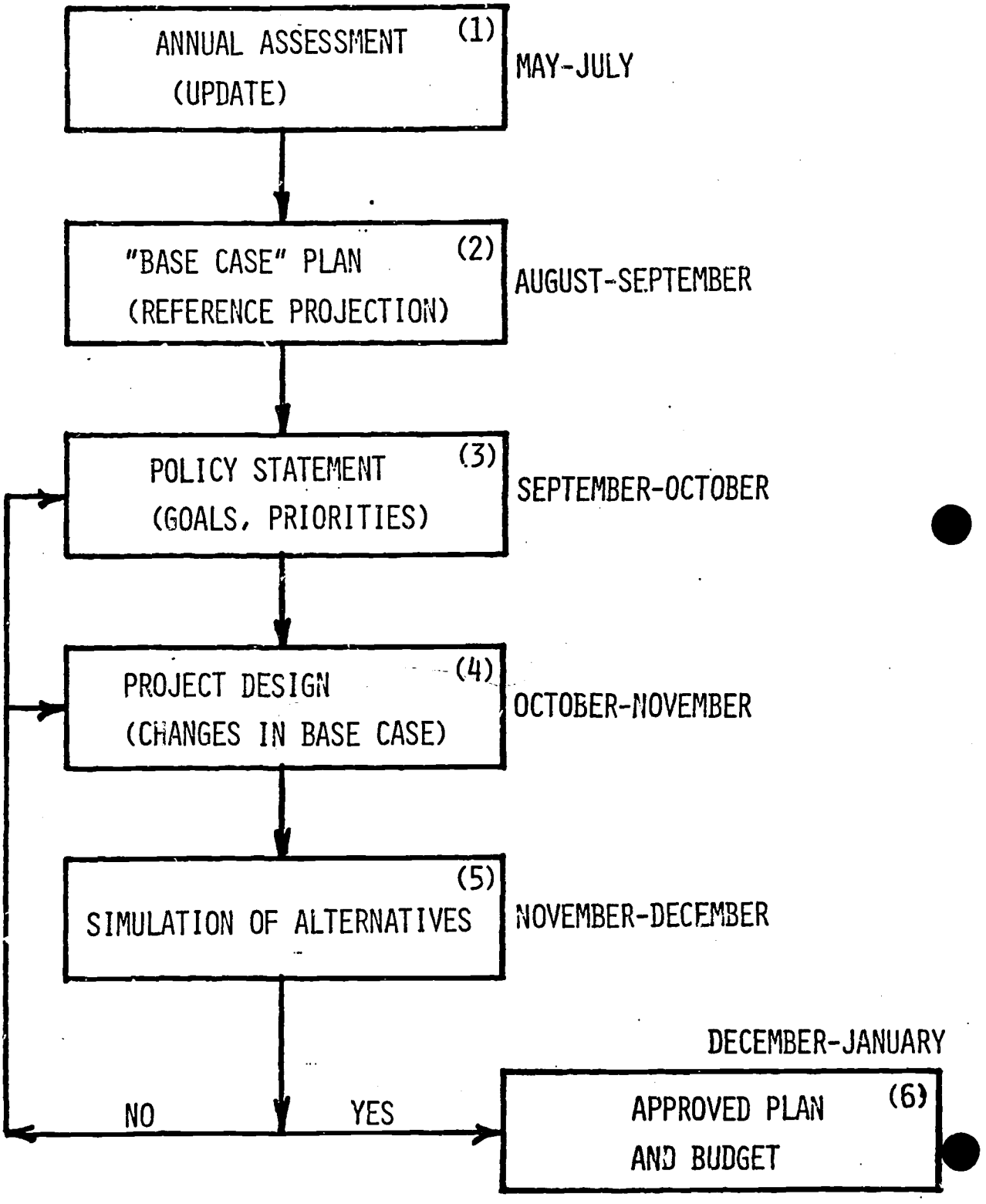
These broad activities can be understood only by describing their components in more detail. The paragraphs that follow describe these elements at the conceptual level; operational definitions are provided in the system's user's manual.

Annual Assessment: Strategic planning requires an assessment of the organization's overall behavior and effectiveness. The assessment reports facts which are important to the decision-makers and planners; in effect, the assessment is an up-dating of the planning information files, which are aggregated at broad levels. Assessment at the strategic level cannot be expected to do the job of evaluating specific projects or students. An analogous process is the general health examination, in which a small set of physiological measures are taken as a broad index of soundness, and more detailed and elaborate tests may be required if some of the broad measures suggest a problem. The analogy also extends to the fact that broad assessments and general examinations are most useful when they are periodic and regular; the most important insights to be learned from the current assessment are those measures which show a difference - either positive, negative, or neutral - from previous assessments.

Current Levels of Effectiveness: In the STEP design, effectiveness is measured by a set of 10-15 Indicators of Quality, scales used to describe the product or output of the school district as a whole. Each

FIGURE 1

MAJOR ELEMENT IN THE STEP CYCLE



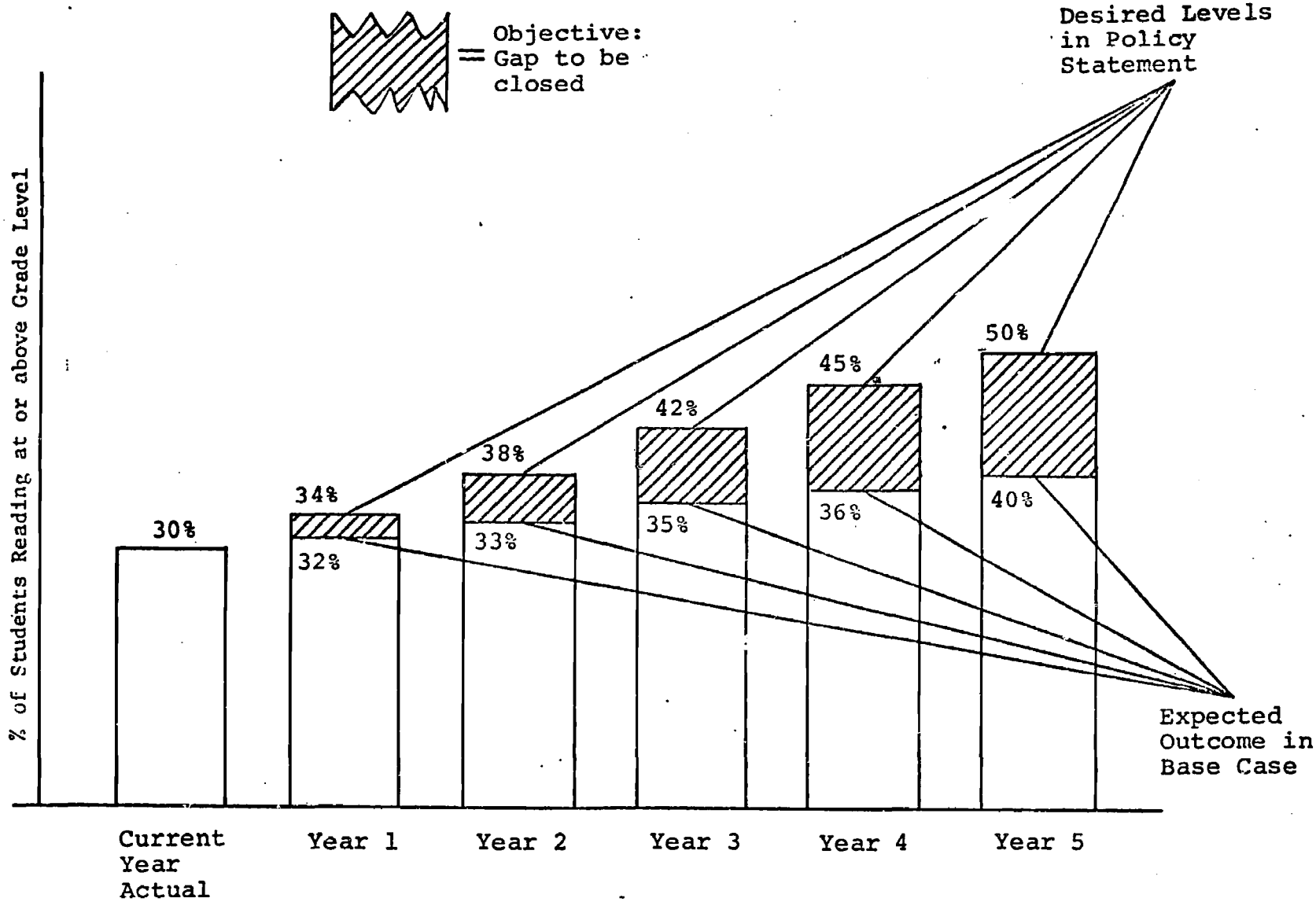


Figure 2 Example of Indicator-Objective Relationship

assessment measures the overall district on those Indicators of Quality. Selection of Indicators is a part of the system development process.

Current Allocation of Resources: Current year approved expenditures are reported by program category, rather than line-item account. Within each program, costs are aggregated by Staff, Non-salary, and Capital Outlay expenditures.

Current Revenue Data: Included also in the assessment is a summary of the revenues currently available to the district, by source, and, where appropriate, by special purpose. The ratio of the various sources to each other is one of the process variables mentioned earlier. The STEP model will forecast Revenues in accord with the state's new "incentive equalization" subsidy program.

Forecasting Models: The planning "model" is a set of formulas and computer programs which converts one set of data into another. At this stage in STEP, the model receives the data from the assessment phase, and computes several forecasts, namely, enrollment, indicators, process measures, costs, manpower, and revenues. The planning model works on the assumption that certain ratios vary at a fixed rate (salaries), certain ratios stay the same (staff/student), and others are allowed to vary independently (total students).

The Enrollment Forecaster projects students by program and ethnic group.

Because the current state of educational theory has developed no scientific notion of how educational activities are related to outcomes, the prediction of future levels on the indicators of quality is necessarily subjective, involving a small group (4-5) of experienced educators (the Review Group).

The cost forecaster expands (or contracts) costs as a function of units of service (change in enrollment), or adjusts costs in certain categories as a function of inflation factors.

The revenue forecaster projects the effects of enrollment change, subsidy formula, and tax base change on the total revenues available to the district, assuming no change in tax rate. Certain classes of revenues which do not vary according to predictable rules are estimated subjectively, or assumed to be zero (certain non-continuing Federal grants, for instance).

The "Base Case": The first major planning system report is called the "base case"; the base case is a candidate plan, showing the effects of approving last year's plan, making no changes in policy or program, showing the impact of changes in enrollment, inflation, and projects previously approved for future implementation.

Note that the current status of the district is not the baseline from which to develop plans. Many administrators and educational planners, influenced somewhat by misleading federal proposal guidelines, make the mistake of identifying needs and objectives on the basis of current data.

Actually, if you are developing a five-year plan, the baseline is what will happen in the district over the next five years if your programs and policies are unchanged, not only what it is happening now. To illustrate, suppose that your assessment data shows that 10% of the students in your district have fundamental difficulties in speaking the English language; over the next five years, even if you make no change in your existing plans or programs, that percentage may change. If you have recently initiated a special set of courses for these students, the number may go down; if the migration of non-English speaking persons in your community increases during the five years, however, the percentage may go up. If your goal were to eliminate the problem - if your desired level on the Indicator of English-language competence were "100%" - you could not begin to design projects and courses without estimating what the extent of the need will be if no change is made. The desired level, (100%), is derived from the goal. The objective is to close the gap between the desired level and the expected level (if no change is made).

The purpose of the "base case" is to show the multi-year implications of carrying forward the current plan without change; the base case is one possible plan, a reference projection, to which the policy-makers and administrators can react. It is reasonable to expect that even in the "no change" plan, the district will change strikingly each year. Certainly, the district's enrollments will change - in numbers and type of students; the salaries will increase (even if there are no new staff members) and the costs of goods and services will also change; the district's revenues will change, even assuming no change in tax rates; projects that were approved in the past will be implemented, causing changes in the district's costs and levels of service.

The base case answers the question: What would probably happen over the next five years if we make no changes in our current plans? The answer to that question is the basis for determining changes - not the current status report.

Depending on the design of a district's individual system, the base case plan includes the following data:

The base case includes a print-out of the expected enrollments over time, by program and student type (ethnicity).

The base case shows the cost implications of the current plan, as a function of inflation and enrollment change. These costs are aggregated by program and for the total district.

The estimated effects on the Indicators are presented out for the five year period.

The base case indicates the number of positions, both new and existing, that will require filling in the five-year period, as a function of both changes in overall faculty size and turnover rates.

The anticipated costs are compared to anticipated revenues, and the needed change in tax rate is indicated.

The levels on the Indicators are compared to the desired levels (developed during last year's policy deliberation activities) and the gaps between the anticipated and desired levels are shown.

Policy Deliberations: The "policies" deliberated in this phase of the process relate only to those affecting planning. The most significant policy decision is to decide what the Indicators of Quality will be, and what desired levels will be pursued by the organization. Other important policies relate to limits on the process relations and parametric ratios, such as class size, salaries, etc.

The annual policy deliberation is, in fact, a review of last year's policy deliberation, to determine what, if any, changes should be adopted in the policy variables. Consequently, the planning process, while sustained over a multi-year period, is flexible and responsive to changing environments and new perspectives - as well as changes in the state-of-the-art of instructional practices.

The choice of Indicators is, in itself, a determination of possible goals. The problem of educational goal-setting is not so much a matter of deciding what ends are worthwhile, but, rather, choosing from among the wide range of desirable ends those that most characterize the administrative philosophy of the district. The goals of the district are simply to improve with respect to the Indicators of Quality; the objectives are to improve some specific amount, in a specific time period.

Figure 2 is an illustration of the Indicator-Objective relationship, for the Indicator: "Percent of students reading at or above grade level." (The numbers in this illustration are fictitious.)

In STEP, an important element of the goal-setting process is an annual community survey which serves as a significant input to the Board and Administration. The Indicators currently being used in Trenton, developed partially through that survey, are shown in Table 1.

"Priority" is a measure of relative importance among the several objectives of the district. It can be expressed in at least three ways;

- a rough grouping of all objectives into high-, med-, or low-priority
- a ranking of all objectives from most to least important
- a specific weighting of the relative importance of each objective, or of the units in each scale (e.g. 1% decrease in "Drop-out" is twice as desirable as 1% increase in "Reading at or above grade level").

Statements of priorities should be more than rhetorical. They must be specific and quantitfied, so that they will influence the subsequent resource allocation decisions.

There are two kinds of constraints - formal and informal. Formal constraints are upper or lower bounds on certain process variables, such as tax-rate increase, square feet of construction/yr., etc. Wherever possible these formal constraints should be specified in the policy report, prior to the evaluation of new plans.

Table 1

Current Indicators For The Trenton Public Schools

Student Performance

- Distance from Grade Equivalence on Standardized Reading Tests
- Distance from Grade Equivalence on Standardized Mathematics Test
- Percentage of Students Entering First Grade with Acceptable Reading Readiness
- Drop-out Rate
- Percentage of Students Graduating with Salable Vocational Skills

Student Body Characteristics

- Average Daily Attendance Percentage
- Percentage of Students in Sub-Standard or Deteriorating Facilities
- Disruption Index (locally defined)
- Incidence/Month of Disruptions Involving Students of Different Races
- Incidence/Month of Harm or Damage Done to Students due to Delinquent or Criminal Behavior
- Percentage of Time Spent by Students in School-Supervised Physical Education or Recreation

School-Community Relations

- Percentage of Eligible Adults Participating in Adult and Continuing Education
- Percentage of Citizens Knowing Certain Facts about the Trenton Public Schools (locally devised survey)
- Percentage of TPS Positions Held by Local Residents

District Charactertistics

- Teacher/Student Ratio
- Books/Student in Libraries
- Percentage Non-Certified Teachers
- Percentage of Teachers with M.A. or Better
- Expenditure/Student (by program)

Informal constraints are those loosely defined feelings about what is or is not feasible, mainly political limitations on possible courses of action. Planners often discover these constraints after plans have been developed; thus, an inventory of constraints develops over the years.

In general, while it is necessary to work within constraints, it is unwise to presume the infeasibility of certain proposals too readily. Politics is defined sometimes as the "art of the possible," but the effective politician makes his own possibilities, rather than yielding to traditional, unchallenged notions about what can or cannot be done.

Design of Project Alternatives: Many school districts undertaking strategic planning for the first time believe that the battle is won when goals are agreed upon. In fact, goal-setting is only midway through the complete planning process.

One of the essential notions of systems analysis, of which PPB is a special case, is that it is possible to design alternative means to any set of goals and select rationally that alternative most likely to be effective and economical.

In STEP, once objectives (Indicator gaps) are agreed upon, several project design groups are created (or selected from existing groups), most containing staff, community, and student members, to write proposals for achieving the objectives. Any proposed change in the operation of the school district is considered a "project;" projects may be additions to the district, deletions from the district (negative projects), or replacements (both a positive and negative proposal).

STEP includes a project proposal activity, akin to (though less cumbersome than) the process of writing grant proposals. After the Board publicly announces its objectives (gaps that need to be closed), proposal development teams draft project designs. Project designs include the following elements

- Expected impact on all Indicators
- Proposed activities (including schedule)
- Estimated costs over time
- Rationale (research or investigation which supports the belief that this proposal will produce the desired results in the specified time).

Proposals must cover all costs, activities and outcomes for the five-year period, with "0" entries for years in which the project is not in effect.

The developing of proposals is an important opportunity for community participation; it is quite important, however, that the project writing teams realize that not all proposals will be approved. For this reason, the project design requirements should be no more arduous than necessary.

All proposals are submitted to a Review Group. This group, four or five professionals, review the competency of the proposals - but do not act on them. The concern of the review group is to make sure that the cost estimates are accurate and complete, that the estimated effects are reasonable, and that the rationale is credible. The review group may require re-writes of certain proposals.

Again, the group does not approve proposals; merely ensures that the estimates of costs and effects are believable enough for the next stages in the planning process.

Re-iteration of Planning Model: Depending upon how many proposals are actually submitted, the planners next consider the implications of approving every possible combination of projects, or many possible combinations. Using the same planning models which converted assessment data to the "base case," project combinations are fed into the program and costs and outcomes are "added on" to the base case plan. (In the case of negative projects, costs, and outcomes may be removed from the base case.) This stage of the process is a simulation of the consequences of approving alternative plans of action. Each combination of projects generates a plan with as much detail as the "base case," including gaps that remain to be closed and indications of revenue feasibility. Sometimes this activity is known as the "What if..." stage; it is the essence of planning.

Selection of "Best Case": The task of the planners is, now, to judge which of the possible alternatives (including the "base case") is the "best" course of action.

STEP allows this selection to be based on quantified criteria of desirability - in terms of both costs and desired outcomes.

Each alternative plan is characterized by a unique estimated cost and unique estimated set of outcomes. These outcomes are aggregated as a function of the priorities and size of remaining gaps associated with each alternate so that each plan can be described as having a single utility and single cost. (This process can be done informally, or formally, through any of several benefit estimating procedures, depending upon the willingness of the planners to make specific statements of personal value and utility.) (See Figure 3.)

The best case, or recommended plan, is finally subject to feasibility review. This is a final check on a number of assumptions made earlier in the cycle. If, for some political, financial, or other reason the plan is unacceptable, the planners may return to their alternative cases and submit the "second best case" and so forth.

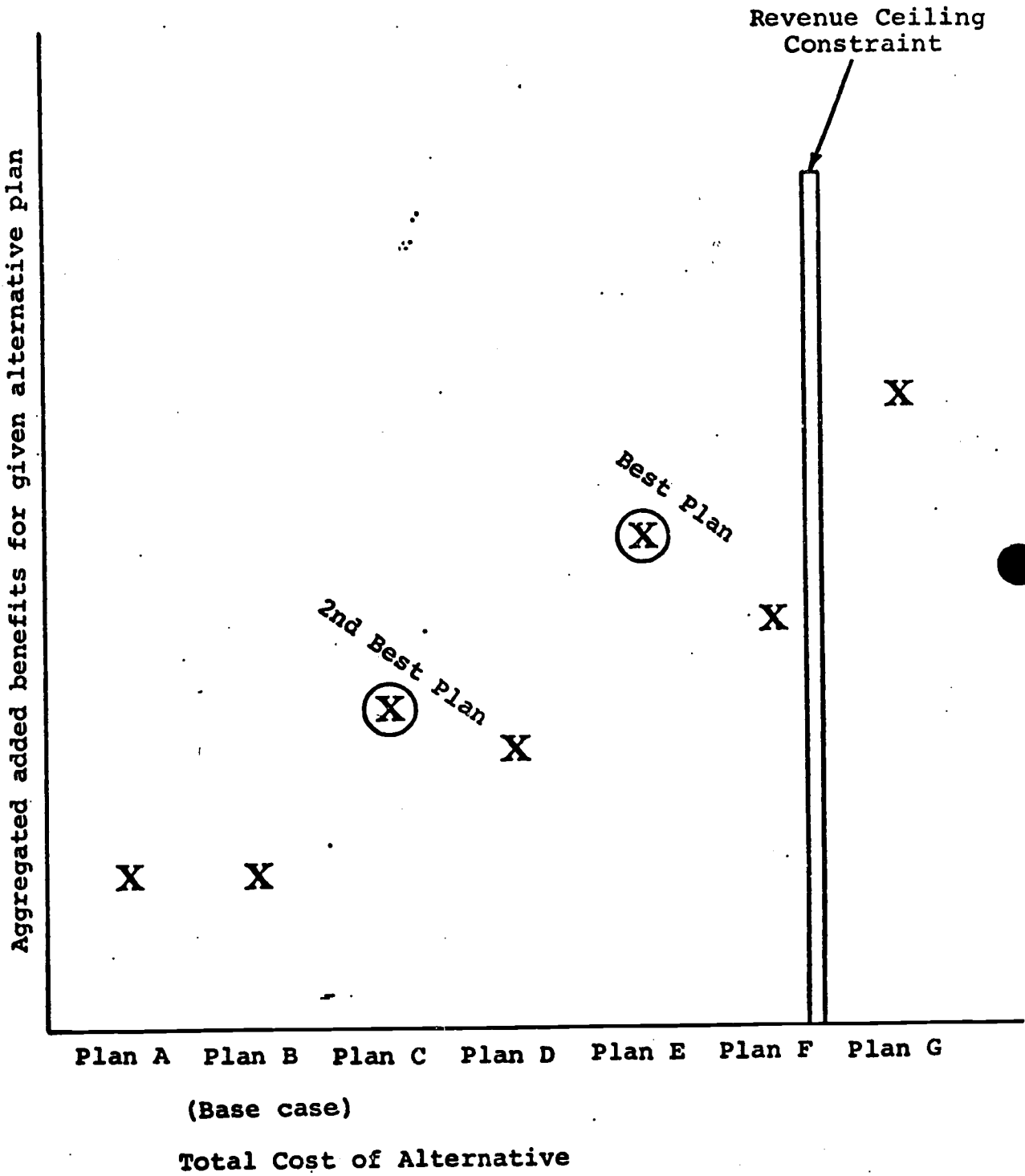
In practice it may be necessary to reiterate parts of the process by running new project combinations through the planning model, or by writing new designs and adding them to the alternative possibilities. As a last recourse, if no feasible plan is found, the decision-makers may consider a revision of policies, that is, a lowering of expectations or a loosening of process requirements.

In STEP, each economic saving is associated with an identifiable loss of effectiveness of quality. Thus, costs are related to outcomes, a relationship which does not occur in typical school budget evaluations.

Generating Year 1 Budget: Approval of the multi-year plan, is, in effect, an approval of the operating budget proposal for the next year - even though the detailed budget has not yet been written. In strategic planning, the decision point is moved back to the pre-preparation stage, and the actual

Figure 3

Illustration of Cost-Benefit Comparison



budget preparation flows almost automatically from the approved plan. After a group of preferred projects has been selected for implementation, the entire results of the planning process must be translated into an operating budget for the next year.

Responsibilities in the Planning Process: Responsibilities for the operation of STEP are assigned to the following persons and units in the public schools:

1. Planning Director - the manager of the STEP systems, and supervisor of all planning activities.
2. Analysts - technical support personnel, responsible for data management and processing.
3. Policy Group - a group comprised of a few senior administrators and the Board of Education.
4. Management Group - building administrators, project and program directors, middle-level administration, etc.
5. Review Group - a panel of 3-5 senior educators, responsible for performance estimates and review of project designs.
6. Educational Community - the entire professional staff of the Trenton Public Schools, represented by a small group of elected persons.
7. Advisory Group - a panel of community and educational agency representatives, previously known as the Technical Task Force.
8. General Public - the community at large, represented through surveys or the Superintendent's Citizens Advisory Group; includes Secondary students.
9. Project Design Teams - groups formed of members of the educational and general communities, to author project proposals.

The Role of the Community: There is nothing, to prevent one man from doing all of a school district's strategic planning all alone, in complete privacy and secrecy. Except that he would be missing an opportunity to exploit one of the principal benefits of strategic planning in education - namely, involving the educational and general community in the planning process; thereby improving everyone's understanding of the decisions and broadening the base of public support. The program-budget format itself enhances the communication between the district and the local government and community. The single greatest complaint of rebelling taxpayers is that they do not see what they are getting for their money, and the program budget addresses this problem head-on.

We cannot say, with any scientific certainty, that STEP will quell taxpayers' resistance or increase the chances for success in financial elections. In part, we are limited in knowing this result because most of the districts embarked on other planning system projects have only begun, and have not yet developed the full planning or communication value of the approach. Even so, several educators have written that PPBS has helped them to get budgets approved, and many more are confident that it will.

CONCLUSIONS

The System for Trenton's Educational Planning has a high probability of successful implementation in the Trenton Public Schools. It has already raised the level of policy debate and broadened the basis of participation.

The project's Technical Task Force has persisted as a viable inter-agency advisory council and has already provided significant opportunities for sharing ideas between, among others, representatives of the administration and teachers associations.

The future is not entirely rosey, of course. During the development of this system, the district was racked by a teachers' strike, a change in the Superintendency, and a volatile school board election. In any given month, there is at least one new, key person in the district who has not heard about the system, and we are not always successful in getting to that person. Further, the system has posed serious data burdens on district staff, even though, to be fair about it, the system does not require any data which should not ordinarily be collected anyway in a well-managed school district.

In sum, those of us who have built STEP believe that it already has, and will continue to, address the goals of the project: to sophisticate the resource allocation process, build better plans with a wider horizon, and facilitate communication. We also believe that the system could be implemented at the conceptual level in any school district, and that at least one or two of the software packages could be adapted to most district's needs.

We are not naive, however, about some of the non-technical problems of implementing systems like STEP. We know that output-oriented planning is threatening to many schoolmen and boardmen, and we know that "truth in spending" is a politically sensitive matter. But we also believe that the current crisis of confidence in school decision-making and budgeting demands a system like STEP.

And, finally, we are convinced that strategic planning, informed by good data, and supported by computing technology, improves the chances that scarce dollars will be used to improve the lot of school children.

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