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COST-BENEFIT ANALYSIS OF EDUCATION.

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DIFFICULTIES ARE ENCOUNTERED WHEN COST-BENEFIT ANALYSES ARE APPLIED TO EDUCATION. THERE ARE PROBLEMS IN THE ATTEMPT TO DEFINE AN EDUCATIONAL GOAL AND IN THE ANALYSIS OF EDUCATIONAL PROCESSES. THE FEDERAL GOVERNMENT IS NOW ENGAGED IN A MULTITUDE OF PROJECTS DESIGNED TO COORDINATE RESEARCH IN EDUCATIONAL IMPROVEMENT. THIS ENTAILS CONTINUED DEVELOPMENT OF EDUCATIONAL, INFORMATION GATHERING SYSTEMS WHERE BUDGET PROGRAMING IS EXTENSIVELY USED. A THIRD PROBLEM ARISES IN THE MEASUREMENT OF COSTS. DESPITE DIFFICULTIES INVOLVED, OPTIMISM EXISTS TOWARD THE PROSPECT OF DEVELOPING A COMPREHENSIVE QUANTITATIVE MODEL OF THE AMERICAN EDUCATIONAL SYSTEM. THIS PAPER WAS PRESENTED AT THE WASHINGTON OPERATIONS RESEARCH COUNCIL'S COST-EFFECTIVENESS SYMPOSIUM (2D, MARCH 13-14, 1967). (HW)

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COST-BENEFIT ANALYSIS OF EDUCATION

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To summarize our thesis briefly at the outset, we find that cost-benefit analysis encounters severe difficulties when one attempts to apply it to education. We believe that fruitful results are likely to be a number of years away. We do not believe that it is impossible or that there is no point in trying. Certainly every effort must be brought to bear on rationalization of the Nation's educational system simply because it is such an important element of our society. It is a very expensive element too; any contribution that can be made to its effectiveness or efficiency will pay handsome returns.

The difficulties are not one but several. To overcome some of them will require extensive research and development programs. Others will require considerable dialogue between educators and the general public about the purpose of education; an attempt to analyze the nationwide educational operation may have as one of its advantages the generation of such dialogue. Other difficulties arise from the diversity of control of education. The primary control is the local school board; there are nearly 24,000 such independent boards. State Departments of Education have a degree of control which varies widely among states. The federal government exercises one element of control of forbidding racial discrimination in any educational institution that receives federal funds.

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The federal government is becoming a strong supporter of cost-benefit analysis in education because it is allocating substantial funds to all sectors of education. Administrators of the funds and Congress are demanding hard information about the accomplishments of these programs and estimates of what might be accomplished by alternative programs. A few State Departments of Education are also beginning to show signs of interest in quantitative management techniques in general and cost-benefit analysis in particular.

Goals of Education. Where one tries to get beyond the easy majestic generalities in order to list goals to which he can attach measures, he finds confusion. For example, there is the goal of equal educational opportunity for all children together with the generally accepted proposition that racial isolation detracts from educational opportunity. In conflict with it is the goal of the neighborhood school closely in tune with the parents' desires for their children's education. Society is not yet of a mind as to whether it prefers desegregation to the neighborhood school or vice versa. That uncertainty leaves the analyst considerably frustrated.

But analysts are persistent people and determined to analyze in any case. Opportunity is not education, some will say (skipping over the condemnation of millions of children to second class citizenship). Education is preparation for the full and productive life. (Music, dancing, art, literature, lectures, sports, drama, political participation, civic affairs, church work, and a job.) Why not measure the fullness and

and productivity of life and then set up some relations showing how different aspects of schooling contribute eventually to those outcomes? Maybe sometime, but not this year or the next.

Well, let's get down to fundamentals like reading, writing and arithmetic. Those are what education is really concerned with and we can measure those things by means of achievement tests can we not? There do exist good instruments for measuring some educational outcomes of this kind but not for others that many educators would consider equally or more important: judgment, social competence, analytical capability, personal orientation, creativity, conceptualization. When one examines the lives of particularly successful individuals, these hard-to-measure abilities usually appear to count for a great deal more than skill in reading, arithmetic, chemistry, Latin, algebra, grammar, and the like.

While we are on the subject of goals, we may note that some educators speak of these difficult-to-measure items as the main goals of schooling and the school subjects as simply devices for attaining those goals. Thus Latin is not really studied for its own sake but to teach the logical structure of language, to enhance deeper understanding of the origins and foundations of English, and hence to improve the lucidity and precision of communication, etc. If there is any truth to such statements it should be easy to demonstrate that curriculum design is mainly witchcraft. Not a very promising basis for meaningful quantitative analysis.

In brief, education has a multiplicity of goals, none of which is dominant. It is not even clear what all the goals really are. Some acknowledged goals are mutually inconsistent. Some of the most easily defended goals (associated with success in adult life) must be measured so far in the future that they cannot be used for evaluation of today's educational programs.

Complexity of the Educational Process. The educational process has a degree of complexity quite beyond that of any other process we have been accustomed to analyzing. Even military conflict between infantrymen is a simple process beside education. The reason is that the infantrymen are carrying out explicit roles in a highly organized way to operate a specific weapons complex in a highly planned way. The military unit is supposed to be a machine and the people in it merely parts of the machine. Of course it is not quite that way in practice but the deviations are usually not so serious that they cannot be treated by relatively simple statistical devices.

In analysis of the educational process we encounter all the difficulties of social science at their worst. Education is a vast panoply of human and procedural interactions which completely dominate the effects we would like to analyze. As a simple illustration, let us consider two widely employed methods of teaching a child to read: in one method the child learns complete words directly while in the other the child learns individual letters first and then learns words as combinations of letters. Our school system has taught millions of children to read by both methods. Which is better?

Strangely enough, we don't know. When we look at some data relevant to how fast or how well children learned to read, we find that the signal seems to be totally submerged in the noise. Knowledgeable educators explain why. The method is really a small part of learning to read and it often does not make a great deal of difference what method is used. If a teacher happens to have a personal preference for a bad method, then that teacher may well have more success with that method than with a good method. If there is real empathy between the teacher and the child then the child is going to be a very successful reader no matter what method is used. If the child has already learned to read from his mother, then any method used at school is going to look great so far as his performance is used to measure it.

If the teacher is extremely able and commonly uses any of several methods and can diagnose the child's abilities well enough to select an especially suitable method for that particular child, then that method is going to show up well on two counts: not only was it especially matched to the child but the child had a fine teacher. It might have been a terrible method for most children or for most teachers.

If the teacher is first an athletic coach and doesn't know much about what he is teaching nor how to teach it but is an enthusiastic motivator of children, then the children will learn the material themselves and whatever you call his method will turn out very well in the data you collect to evaluate the method.

If the child's parents take a serious interest in his school work and keep up with what he is doing at school and make sure he understands all the material being presented at school, then the methods used at the school will appear to be very effective when judged in terms of this child's achievement.

If the child's playmates or classmates generally feel that school-work is interesting or fun or important or must be accomplished for whatever reason, then the child will usually learn regardless of teachers and methods. A recent massive survey carried out by the Office of Education indicated that the educational inclination of a child's classmates was even more closely associated with his educational achievement than the quality of his teachers.

All these positive interactions have their negative counterparts and there are many others. Thus we must accept the fact that the educational process is beset by a complex array of interactions of all sizes and shapes between teacher and children, teachers and parents, children and parents, teachers and curricula, parents and curricula, children and curricula, school administrators and everything, everything this year with everything last year and the year before that. These interactions frequently override the thing we are looking for. One negative interaction between a child and a teacher in an early grade can conceivably throw the child for a loss from which he will not recover in a lifetime because it can permanently type him as a C student in his own mind and in the minds of other teachers in the school whereas actually he could have been a B student.

Thus it is altogether possible that we may sometimes not be able to assess the impact of an educational device or method upon a child without knowing much of his past history including his significant interpersonal experiences.

The Multiplicity of Federal Programs. The fact that elementary and secondary education are locally controlled in this Nation means that analysis of the system will certainly depend on efforts of the federal government for many years to come. No local school district or State could justify the large research and development costs required before a tangible pay-off can be expected. The nature of the federal programs is not such as to invite optimism, however.

In Fiscal Year 1966, the Office of Education administered 68 programs of financial aid ranging in size from less than a hundred thousand dollars to nearly one billion dollars. They influenced in some way about 2,500,000 teachers, 54,000,000 students, 125,000 schools and colleges and reached into almost every town, hamlet, county and city in the United States. These programs were administered by five different bureaus, 50 State Departments of education, and some 24,000 separate school districts, each one a distinct administrative unit with near total autonomy in its operations.

To add to this general picture, there are over 40 agencies of the Federal Government that disburse money for educational activities, and it is estimated that they touch in some way an additional 14,000,000 persons. In fact, the 68,000,000 people being touched by federal assistance to education is close to the number of people working - which was about

75,000,000 in December, 1966. When a nation allocates resources enough to help that many people in their educational pursuit, then an accounting of this stewardship surely seems in order. On the other hand, while the Office of Education is the most visible agency responsible for information reporting and cost-benefit studies in education, it handles only about 25% of federal expenditures in this area and provides only about 8% of the Nation's total budget for elementary and secondary education. That is, the federal programs are all merely adjuncts to our basic educational system. The federal task is therefore one of evaluating numerous small perturbations of a massive system which itself is not even slightly understood in any quantitative operational terms.

Educational Information Gathering Systems. One of the distinguishing features of our nationwide educational information system is its voluntary nature. Almost all of the original data flow from the field to the Office of Education under cooperative arrangements which recognize mutual interests. Excepting the Civil Rights Compliance Program, nearly all information distributed by the Office of Education is returned to the sources from which it has been collected in a form cooperatively designed to help educators plan and execute their programs. The traditional goals of the reporting system are that it:

1. Improve the quality of education,
2. Support Congressional and legislative actions,
3. Measure the extent of educational programs,

4. Minimize duplication of data collection and,

5. Maximize consistency of data.

You will observe that the decision-making elements in a data reporting system with these objectives are minimal. At best the decision-making is advisory rather than obligatory, and emphasizes dissemination rather than decision as its chief criterion of usefulness. Thus the data collection system is not oriented to program structure, but rather to the historic local nature of the educational process, emphasizing local control, and local decisions; it is a program to supply background information to the educational community. We must recall again that the decision process in education is distinctly local in nature and influenced by specific local concerns. Only when these local concerns are extended upward to meet a downward flow of funds from the federal government is there a commingling of interest in information that will support a decision process at other than local levels.

Let us consider a specific illustration. Title I of the Elementary and Secondary Education Act allocated approximately $990,000,000 of federal funds for the support of "educationally disadvantaged" youths. This program adds to the traditional function of collecting and disseminating information a need for information of an evaluative nature. This kind of information cuts at the heart of the traditional process so far as data gathering and dissemination are concerned, for the information must now reveal some answer to the preplexing question of "What has been accomplished by the $990,000,000 investment?" Thus the informational process must adjust to this new dimension of reporting and provide types of data not needed

prior to the federal government's support at local educational operations.

Needless to say, the educational community is not leaping to embrace this new dimension of reporting. Local educational agencies, which have always had almost total control of their educational systems, worry about the implications of federal control inherent in evaluational kinds of data. What actions are contemplated by the federal government as a consequence of evaluation? Data for operational analysis of federal educational programs will probably come in slowly.

Information Requirements for Program Budgeting. Program budgeting structures tend to be imposed from the top. Data come up from the bottom, and herein lies an unremitting difficulty. A Program Planning and Budgeting System, which broke out education as a major category, was recently devised by the Department of Health, Education and Welfare. It identified the following classification for which federal funds might be identified: First, there is an identification of the ultimate purpose of the program--such as the development of basic skills and attitudes or vocational and occupational skills. The next set of information seeks to refine these ultimate purposes by identifying whether the resources are to extend present programs or to introduce new ones. The next element of information identifies the impact levels--such as pre-school, elementary secondary, and so on. The final data element is the identification of the program recipient--such as an individual grant, an institutional grant, a local agency grant, and so on. The structure permits an easy identification of how much is spent by purpose, by educational level, and by ultimate program receipient, such as an individual, a state agency, or

a local agency. It is mainly an operational accounting system by means of which one can identify program costs.

Some such system as this is absolutely essential to meaningful cost-benefit analysis of our nationwide educational system. We cannot do cost analysis without costs. Implementation of such a system will however, require revolutionary revision of the accounting systems of 25,000 school districts in the long run. These districts are, of course, accustomed to setting up their own accounts to suit their own requirements. They may well concede that program accounting has something to recommend it, but we can be sure that most of them will resist such a major revision on grounds that the cost will exceed what benefits they can visualize it bringing to their own operations.

Measurement Problems. We do not know what education costs. Estimates have been made, and they range up to $50,000,000,000 per year, but these are money costs alone and reflect a lower bound only. Few school districts and perhaps no colleges allow for depreciation of equipment. Few educational activities allocate costs that are joint in nature. Fewer still capitalize the investment cost needed to erect and modernize new facilities. What is needed, before any real benefit-cost studies can be made of education, is an entirely new data collection system and a set of agreements on what the "real" costs of education are. Should costs borne by individual students be included? What about their opportunity costs?

But costs are easy relative to benefits. Even the financial benefit is most elusive and if there is anything we analysts ought to be

expert at it should be calculation of that kind of benefit. Much has been said about the increased income a person derives from increased education but the essential question is still "How much more productive has he become because of the marginal dollar spent on his education?" Efforts to answer this question in terms of real data on income versus education encounter the following formidable hurdle: High incomes tend to go to able people. Able people tend to do well in school and hence get a substantial amount of education. Also they tend to have able parents whose economic success tends to assist their children up the economic ladder in various ways. Thus only a fraction of the added income of educated people can be attributed to their added education. A fairly elaborate model and an extensive longitudinal data collection program will be required to estimate what that fraction is.

We have already noted that tests exist for measuring the achievement of children in certain academic disciplines. But even here the data may not be immediately forthcoming because of political problems. There is a major development program under way to establish a nationwide periodic assessment of educational achievement; it is being done under private auspices with generous financial support from the Carnegie Corporation and the Ford Foundation. The director of the development program is a very distinguished educator, Ralph Tyler, Head of the Center for Advanced Study in the Behavioral Sciences. It sounds promising but it is far from a sure thing. A sizable section of the educational community has taken a strong position against it. Recently the executive secretary of the national organization of school superintendents circulated his membership

urging total resistance to this proposed assessment program and refusal of access to Dr. Tyler to any school for the purpose of trying out his new assessment instruments.

We have already noted that no instruments at all exist for measuring some of the most important outcomes of education. Some beginnings have been made for creativity and also for personal orientation, but others have not even been thought about. Some of these areas would find great practical difficulty even if instruments existed because they would involve to some degree an invasion of privacy. One cannot go poking into, for example, family psychological problems even though they might have a very strong bearing on the kind of education appropriate for the child.

In our discussion of the many significant interactions that occur in the educational process, it became evident that we shall never construct an adequate quantitative description of the educational process without measures of these interactions and extensive data regarding their statistical distribution through the school system. Thus we are faced with the prospect of developing a whole new class of measuring instruments which have to do, among other things, with the difficult matter of the degree of rapport between two humans.

Outlook. We are not pessimistic about operations analysis of the American educational system. We are merely convinced that a comprehensive quantitative model is a very big job which will require large resources and many years. We have explored these difficulties to indicate why the job is big and to show what some of the crucial elements are.

Certainly rudimentary analyses can be done now and in the near future. We are doing such things now. A survey of educational opportunity done by the Office of Education last year reached 600,000 pupils and that was a large enough sample that a few signals could be detected in the noise.

And there is reason for optimism with respect to the whole problem. There is widespread recognition that analysis of the system is mandatory. We cannot allocate over $50 billion per year to an activity without making substantial efforts to allocate it effectively. The federal government is now committed to such analysis; it has created a division containing twenty professional people in the National Center for Educational Statistics of the U.S. Office of Education for just the purpose of developing models of the American educational system.

More importantly, there is now real promise of effective research of educational processes. In the past, educational research has been done mainly in small projects which could be financed by university departments of education. Mostly they revolved around Ph.D. theses. That kind of attack could not possibly illuminate such a complex operation as education. Recently the federal government has begun to allocate some $100 million per year to educational research. Much of that money is going to several newly created multidisciplinary research institutes which will be able to attack some of the problems we have discussed on the scale required. In a few years we should begin to get an understanding of all those interactions that occur in the educational process, their relative sizes, their relationships, and what can be done to modify them.

With that kind of knowledge, we can eventually develop a satisfactory

quantitative model of the operation. Then we shall have a context within which meaningful information can be sought about matters under the direct control of school administrators: curricula, methods of teaching, school organization, class size, teacher training, tracking, integration, architecture, equipment, personnel policies, diagnosis of childrens' abilities, matching of teachers and methods and curricula to children, etc. Some day a school superintendent will be able to say something like this to his community: "With the total budget you propose I can get an annual average of about 31% of your high school graduates into college; with another $100 per pupil I could get it up to 44% and with still another $100 I could raise it to 54%."