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A PILOT CENTER FOR EDUCATIONAL POLICY RESEARCH. FINAL REPORT--PART II (APPENDICES).

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THIS DOCUMENT CONTAINS THE PAPERS PREPARED BY THE PILOT CENTER FOR EDUCATIONAL POLICY RESEARCH STAFF WHICH ARE THE BASIC SOURCE MATERIAL SUMMARIZED IN PART 1 (ED 014 222). THESE PAPERS DESCRIBE THE ACCOMPLISHMENTS OF THE CENTER IN DEPTH, TELL SOMETHING OF THE ASPIRATIONS AND ASSUMPTIONS FOR THE PROPOSED OPERATIONAL CENTER, AND CONTAIN THE FINDINGS AND CONCLUSIONS OF THE PILOT STUDIES. THE PAPERS COVER THE FOLLOWING GENERAL TOPICS--(1) THE RESULTS OF THE INVESTIGATIONS INTO THE METHODOLOGY OF CONJECTURING ABOUT THE FUTURE, (2) THE POTENTIAL UTILITY OF COMPUTER PROGRAMED MATHEMATICAL MODELS FOR EDUCATIONAL PLANNING, (3) THE RESULTS OF AN EXPERIMENT DESIGNED TO EXPLORE THE EDUCATIONAL "WANTS" OF "FUTURE PREFERENCES" OF A SELECTED NUMBER OF DIVERSE GROUPS AND ORGANIZATIONS IN SOCIETY, (4) THE RESULTS OF AN ANALYSIS OF POSSIBLE FUTURE ROLES OF EDUCATORS IN A POST-1988 WORLD, (5) FINDINGS OF AN INVESTIGATION OF THE UTILITY OF AUTOMATED BIBLIOGRAPHIC AND FORECASTING METHODS DATA FILES FOR USE IN AN OPERATIONAL CENTER, (6) THE USE OF "SYSTEM" CONCEPTS AS AN AID IN THE EDUCATIONAL POLICY MAKING PROCESS, AND (7) COMMENTARY ON THE EDUCATIONAL POLICY MAKING PROCESS. (HW)

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FINAL REPORT: PART II (APPENDICES)

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A PILOT CENTER FOR EDUCATIONAL POLICY RESEARCH

PART II

February 1968

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

A PILOT CENTER
FOR
EDUCATIONAL POLICY RESEARCH

PART II

Project No. 7-1003
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APPENDICES

FOREWORD

Part I of our final report summarizes the pilot projects that were conducted by the Center's staff and includes their objectives, methods, results, and implications for a proposed operational center for educational policy research, and conclusions and recommendations for the organization and administration of a program of activities to be implemented in the operational center.

This document (Part II) is an integral element of our final report, and has been separated from its companion document only for the reader's convenience. It includes a collection of papers prepared by our Pilot Center's staff. They contain the basic source material which has been summarized in Part I. These papers describe our accomplishments in depth, tell something of our aspirations and assumptions for the proposed operational center, and contain the findings and conclusions of the pilot studies. In order fully to understand our philosophy and perspectives for the operational center, and to appreciate the nature and extent of our efforts during the nine-month contract period, we urge the reader to spend the time necessary to read these papers, and to reflect on them seriously since they represent the major substantive contributions of the Pilot Center.

Appendixes A and B, by Perry E. Rosove, describe the results of our investigations into the methodology of conjecturing about the future. Appendix C, by Zivia Wurtele, surveys the potential utility of computer programmed mathematical models for educational planning as they might relate to the program of activities that are recommended for the operational center. Appendix D, by Thorington B. Robertson, presents the results of an experiment designed to explore the educational "wants" or "future preferences" of a selected number of diverse groups and organizations in society. Appendix E, by Perry E. Rosove, provides the results of an analysis of possible future roles of educators in a post-1988 world. Appendix F, by Jack Jaffe, presents the findings of an investigation of the utility of automated bibliographic and forecasting methods data files for use in an operational center. Appendix G, also by Jack Jaffe, illustrates the use of "system" concepts as an aid in the educational policy making process. Finally, Appendixes H and I, by Harry F. Silberman and Harold Horowitz, respectively, provide illuminating commentary on the educational policy making process.

APPENDIX A

A PROVISIONAL SURVEY AND EVALUATION OF THE CURRENT FORECASTING STATE OF THE ART FOR POSSIBLE CONTRIBUTIONS TO LONG-RANGE EDUCATIONAL POLICY MAKING

by

Perry E. Rosove

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I. INTRODUCTION

This paper presents the results of a provisional survey of existing forecasting methods to attempt to determine their possible relevance and usefulness for an operational center responsible for supporting future oriented policy formulation and decision making in the field of education.

The primary concern of this paper, it should be emphasized, is not with methodology as such but with its use. The questions of concern to us here are: What functions should an operational center perform? Can existing forecasting methods contribute to the functions of an operational center? How can the methods contribute to a public dialogue about the future of education?

Part II reviews briefly the current state of the art in forecasting methodology and provides some working definitions. Part III reviews the possible functions of an operational center and relates the methods identified and defined in Part II, B, to those functions. Part IV provisionally evaluates the potential capabilities of the identified methods to support Center functions. Part V reviews the concept of "method strings." Part VI briefly discusses the next step.

A caveat must be duly noted before we proceed. We do not regard curselves as experts on forecasting methods. There are few persons in the world today who would so qualify. This paper is offered, then, not as a definitive work, but as an initial and provisional step in a long-range process the ultimate objective of which should be to contribute to the creation of a science of futurology and to put that science in the service of education.

II. CURRENT FORECASTING STATE OF THE ART

A broad survey at the present time of attempts at conjecturing about the future very quickly reveals that there is no recognized science or field of futurology. There appears to be, rather, almost as much variation in the type of approach to the subject as there are active futurists. Forecasting efforts vary extensively with regard to purposes or objectives, theoretical assumptions, concepts employed, degree of concern for methodological rigor, substantive areas of interest, the use of data, the time period considered, etc.* There is no widely accepted classification scheme for forecasting methods. The problem is further confounded by the lack of a standardized language by means of which the futurists can communicate with one another. There is not even agreement as to what constitutes a "method" or what is meant by a "forecast."

As a result of these conditions, anyone can play the game of conjecturing about the future regardless of his interests, background, experience, or training. There are no credentials which differentiate the qualified futurist from the unqualified, or the responsible student of the future from the irresponsible. There are, in too many pronouncements about the future, no publicly acceptable means whereby one conjecture can be considered to be more valid, more relevant, or more useful than another.** And as long as this situation prevails, the policy maker, in education as in other fields, may have no recourse but to accept a conjecture which suits his personal biases, or he may be faced with inconsistent or conflicting conjectures which make inaction seem to be the most reasonable course to take.

It is essential, then, in light of the current state of the art, to begin with some working definitions which will allow us to proceed in a rational fashion with the investigation of forecasting methods for the purposes of this paper.

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* Some feeling for the range and variety of these efforts can be obtained by reviewing the following sources: H. S. Parnes, Forecasting Educational Needs for Economic and Social Development, Organisation for Economic Cooperation and Development, 1962; Daniel Bell, "Twelve Modes of Prediction - A Preliminary Sorting of Approaches in the Social Sciences," Daedalus, Summer 1964, pp. 845-880; Erich Jantsch, Technological Forecasting in Perspective, Organisation for Economic Cooperation and Development, October 1966; Bertrand De Jouvenel, The Art of Conjecture, New York: Basic Books, Inc., 1967.

** One long-range goal of an operational center should be to establish the criteria for credentialing professional futurists.

A. Definitions

1. Definition of "Forecast"

The term "forecast" is an impediment to the clarification of the objectives of an operational center for educational policy making. While it is true that the Center must be concerned with what the future might be like, and hence the need for "forecasts" in the traditional sense is clear, of even greater importance is the evaluative function of policy makers to avoid some possible futures and to achieve others. Thus, when we speak of methods throughout this paper we are equally concerned with those which foretell the future in a probabilistic sense, and those which serve to facilitate the process of selecting and realizing a desired social or educational end-state.

There is another sense in which the term "forecast" is a stumbling block. The traditional use of the term conjures up a one-shot effort to conceive some mental image of the future. Yet it is well known that thinking about the future also molds and channels what the future will be. This dynamic process is recognized by the notion of the "self-fulfilling prophecy." From this point of view, a "method" may also be a set of procedures for moving from the present into the future under the control of legitimate authorities. In this orientation, what is known about the present, what is regarded as likely to happen in the future, and the desired end-state are all constantly undergoing modification through a cyclical, interacting process.

One of the most difficult problems in the analysis and use of current forecasting techniques is that of validation and credibility. To what extent does a specific "forecast" reflect the application of a "method"? Is a forecast acceptable, useful, or significant merely because an expert in some field has made a pronouncement about the future? For example, how does the trained scientist deal with prognostications like this:

> "Under electric technology the entire business of man becomes learning and knowing. In terms of what we still consider an 'economy' (the Greek word for a household), this means that all forms of employment become 'paid learning,' and all forms of wealth result from the movement of information." *

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* Marshall McLuhan, Understanding Media, New York: McGraw-Hill Book Co., 1965.

The important issues of defining what a method is and what is meant by their validation or credibility must be considered in light of the "types" of conjecturing about the future we have begun to differentiate above. Two different types of forecasting are widely recognized in the literature. One type --extrapolative--begins with past and present data and projects them into the future; the second type--anticipatory or "normative"--conceptualizes a desired future. The former type is concerned with what might be; the latter type is concerned with what should be. Methodologically, the extrapolative type of forecasting must adhere to the canons of science. But since the anticipatory type is a matter of value choices, the canons of science are not relevant in the usual sense. These points require elaboration. First let us define what is meant by a "method" in the traditional sense.

2. Definition of "Method"

If a forecasting activity is to be identified and classified as a method according to traditional canons of science, it should possess the following attributes:

- a defined sequence of procedures which is systematically followed in all applications;
- communicability of the knowledge produced in a form such that it can be employed by other investigators;
- independent verifiability of the claims of knowledge produced.

As we have noted, these canons are applicable to the extrapolative type of forecasting. This is so since this approach is presumably concerned with matters of fact such as historical records or observable events.

The traditional canons of science cannot be applied to anticipations about the future or to evaluations of what education should be. These are not questions of fact. Nevertheless, there are "methods" which contribute to this type of exploration of the future. These methods are best described, perhaps, as sets of procedures, at present not always well defined, which facilitate public dialogue about the future. A process of public choosing from among possible alternative futures might include the following steps:

- generation of alternative possible futures;
- presentation or display of possible alternative futures and/or relevant data which is equally accessible to all interested parties;
- public debate on the alternative futures, pathways to achieve them, and their possible consequences;
- public selection of a desired future and pathways to achieve it;
- a monitoring process whereby the movement toward or away from a desired future can be ascertained by feedback techniques and corrective steps taken in time to affect the outcome.

In traditional science, as noted above, the validation of a theory or hypothesis requires that it be stated in a form such that it is most easily testable.* The best theory is the one which is testable in the most rigorous way. However, theories which are so stated that they cannot be tested may still serve a purpose within science as stimuli to thought and to identify problems worth investigation. From this point of view, the quotation from McLuhan above may not be a testable theory but it may be useful methodologically in that, as a deductive rather than an inductive approach, it generates rich theory, many hypotheses, and a wide variety of deductive-type hypothetical consequences. This is a useful first step in a set of procedures for the study of possible alternative futures. However, it is critical to recognize that McLuhanisms are just a first step. These same propositions apply also to interpretations of the activities of many young people today as a social movement.** These interpretations provide stimulating and thought-provoking hypotheses about what is "happening" and what may happen in the future.

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* The following comments on theory testing are derived from Karl R. Popper, The Logic of Scientific Discovery, New York: Basic Books, 1959, Chapter I.

** See, for example, J. L. Simmons and Barry Winograd, It's Happening: A Portrait of the Youth Scene Today, Marc-Laird Publications, Santa Barbara, California, 1966.

It is evident that such first steps in a sequence of procedures do not establish the validity or "truth" of a forecast since there are no facts about the future which can be validated. What can be provided, beginning with these theories and others like them, is a set of systematized and public procedures which hopefully will make more credible, reasonable, and responsible the choices policy makers must make.

Both types of methods, as defined above, are represented in Table 1 (page A-19) and in the following discussion.

It should be recognized explicitly that none of the methods currently used in forecasting have the sort of precision about them that we attribute to laboratory experiments in physics or chemistry. Even in the field of demography different results are obtained in time-series extrapolations of population growth since the scientists involved employ different assumptions. What we must do is recognize the limitations of all forecasting methods, accept the fact that the future can be usefully studied nevertheless, make use of those methods that best lend themselves to different purposes, and, with all possible speed, work to improve all the relevant methods available to us. An eminent philosopher some time ago stated the issue in these words:

> "Although the form of scientific or empirical method is constant, any part of it, any of its guiding conceptions, may very well undergo change. In short no portion of the method, no corner of the results should be made a fetish. The reciprocal interaction of methods and results allows for progressive correction suitable to a world in which change is so pervasive a feature."*

B. Definitions of Futures-Creating Methods

The list of twenty-one methods for conjecturing about the future and for contributing to the attainment of a desired future which are identified and defined below do not by any means exhaust the number of possible methods which might be useful in the operational center. The methods presented are a set that were readily identifiable in the course of a two-month survey and they appear to encompass the major methods identified in the various sources which were examined.**

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* Abraham Edel, The Theory and Practice of Philosophy, New York: Harcourt, Brace and Company, 1946.

** See bibliography of the SDC Pilot Center Progress Report for August, 1967.

Additional methods will be added to the list as their relevance is determined.

The list is essentially a new set of methods, although the names identifying them are not new. They have been abstracted or culled from several different sources. Some of the methods listed below are composites of several methods which were identified by different names in the original sources although they appear to be identical or similar in nature. Some methods which are described in various sources are not presented here since not enough information about them was available to make any evaluation possible. This will not rule them out for possible consideration at a later date. Other alleged "methods" have not been included here since they appeared to be highly idiosyncratic efforts to cope with specific problems and did not meet any of the criteria for a method as noted above. Two methods, content analysis and expert opinion, were not described in any of the sources reviewed but they are included here because they are commonly used and because of their relevance to the possible functions of an operational center. The list also represents an effort to find a balance between the forecasting of technological developments and the forecasting of social phenomena. Such a balanced approach does not now exist in any of the sources studied. Methodology is relatively highly developed in and widely used for technological and economic forecasting, but it is relatively undeveloped for non-economic, sociocultural phenomena--the type of phenomena of special interest to educational policy makers.

It should be noted that for the purposes of this report we have not developed a logical classification scheme for methods. What we have done as a first step is to list and define some of the methods which other investigators have declared to be significant by naming and using them. We have also attempted an initial evaluation of forecasting methods in terms of their potential to support possible functions of an operational center for educational policy making. In addition, we have rank ordered the methods for their presumed potential utility. While the development of a logical classification scheme for methods would be desirable, it would be premature for us to attempt this. A more exhaustive analysis, evaluation, and classification of forecasting methods is a major undertaking which is not the function of a pilot center but, rather, an appropriate responsibility for an operational center.

Definitions

1. Brainstorming: a form of group dynamics designed to encourage creative and imaginative thinking about the future via an uninhibited exchange of ideas.

2. Delphi technique: a procedure for systematically soliciting and collating the opinions of experts on the future of a preselected subject by sequential individual interrogations, usually by questionnaires. An effort is made to achieve consensus or convergence of opinion by the feedback of results to the participants.

3. Expert opinion: the opinions of qualified specialists about the future of the phenomena within the field in which they have renown or the recognition of their peers.

4. Literary fiction: novels or other forms of literature which imaginatively or creatively construct future social systems or conditions.

5. Scenarios: the imaginative construction into the future of a logical sequence of events based upon current conditions.

6. Historical analogy: inferring the similarity between attributes or processes of two or more different historical developments, social conditions, or societies on the basis of other presumed similarities.

7. Historical sequences: formulations of the independent recurrence of similar sequential social, economic, and cultural processes and conditions in different societies or nations; or the treatment of sociocultural phenomena, in general, in terms of logico-historical sequential phases or stages of development.

8. Content analysis: abstracting from content--speeches, novels, art forms, etc.--generalizations or trends pertaining to a wide range of phenomena such as public attitudes, values, political ideology, national style, etc.

9. Social accounting: an effort to conjecture about the future of a nation, social system, or institution by determining the "sum" of a series of independent factors, a, b, c, ...n which comprise it at time t, resulting in profile A, and then progressing to series a', b', c', ...n' at time t', resulting in profile B.

10. Primary determinant: the interpretation of sociocultural events, conditions, and processes in the past, present, and future in terms of the consequences of a single major

factor or primary determinant such as Marx's mode of production or McLuhan's media.

11. Time-series extrapolation: the extension of a series of measurements of a quantity over a period of time from the past into the future.

12. Contextual mapping: the extrapolation in graphic form of the interrelationships of functionally related technological developments. A "map" shows logical and causal interdependencies.

13. Morphological analysis: a systematic procedure for exploring the totality of all possible solutions to a given large-scale problem, i.e., all possible ways of propelling rockets. The definition of the problem provides an initial set of parameters and the full range of possible answers to the problems inherent in each initial parameter represent another set of parameters, and this set is then explored, and so on, until all the parameters have been explored. A possible solution to the problem of propelling rockets may then be any combination of the dependent parameters within the sets of parameters at different levels of the analysis.

14. Relevance trees: a procedure for determining the objective means or techniques required to implement an explicit qualitative goal, i.e., to permit all students to proceed through educational programs at their own pace. Each branch point of the tree, moving downward from the stated objective, represents a potential decision to follow a particular implementation direction. Either qualitative or quantitative criteria, or both, may be used to aid the selection process. Each subsequent branch level is considered, in turn, as a possible set of alternative goals and each alternative is analyzed to determine the objective means required to implement it.

15. Decision matrices: a method for allocating resources, determining priorities, or selecting goals by graphically displaying the relationships of multiple interdependent variables in two or three dimensions. For example, one dimension of a decision matrix in education might be available funds while the other dimension might be faculty and administrators' salaries, maintenance costs, library costs, etc.

16. Deterministic models: a deterministic model is a mathematical abstraction of real world phenomena. It is a set of relationships among quantitative elements of the following types: parameters, variable inputs, and variable outputs. The development of computer technology has made possible the implementation of models which are too complex for non-computerized solutions.

17. Probabilistic models: a probabilistic model is a mathematical representation of the interactions among a number of variables in which the value of at least one variable is assigned by a random process. The numerical results of repeated exercises of the model will yield different numerical values. The values of variables may be based on estimates of future conditions. A computer facilitates running innumerable exercises of the model.

18. Gaming: not to be confused with game theory, provides a simulated operational present or future environment structured so as to make possible multiple simultaneous interactions among competing or cooperating players. Games may be entirely manual in nature, or a computer may be used in some types of games to provide simulated inputs to the players and to record and analyze their performances.

19. Operational simulation: the exercising of operators of a system in their actual environment by the use of selected simulated inputs to provide education and training to the system's operators and/or to facilitate analysis and understanding of the system's operations for evolutionary design and development. The inputs may represent the world of the future.

20. Benefit-cost analysis: a quantitative method designed to assist decision-makers to make the most efficient trade-offs between financial resources and competing programs. The total cost of each program, both direct and indirect, is estimated and the programs may be evaluated in terms of the advantages, outputs, or results (benefits), both short-run and long-run, which each is estimated to have. These estimates are expressed quantitatively. Since both program costs and their benefits have specific values, several alternative courses of action may be systematically compared and evaluated.

21. Input-output tables: models of an economy which is disaggregated into sectors and in which explicit account is taken of sales and purchases between sectors. One set of parameters which is common to all such models are technical cooefficients; the technical coefficients of an industry are the number of units of input of each industry which are required in order to produce one unit of output of the given industry.

III. POSSIBLE FUNCTIONS OF AN OPERATIONAL CENTER

The following list of functions is representative of the general type of activities and responsibilities which would probably be undertaken by an operational center for educational policy formulation and decision making. The list, of course, is highly tentative and incomplete at this time and is presented here merely to facilitate the consideration of methodologies for the study of the future in education. As the functions of the operational center are more precisely and completely defined, the relevance of specific methods will also become more clear. The development process relating functions and methods is iterative in nature.

The operational center should have the capability to provide for at least the following major functions or activities:

A. generate alternative futures, both extrapolative and anticipatory (what might be and what should be)

B. explore alternative pathways to desirable futures

C. explore the alternative consequences of policy decisions

D. achieve via public dialogue a selection of preferred futures and pathways to them

E. conduct training for policy makers in the study of the future and in decision-making about the future

F. conduct research on selected problems pertaining to group decision processes, forecasting methodology, and the future of education

G. identify information needs

A brief explanation of each of these Center functions, as presently conceived, is presented below.

A. Generate Alternative Futures

This function includes both types of conjectures about the future--extrapolative and anticipatory. For both types a range or fan of possible futures is sought rather than a single "prediction" or "forecast" which is alleged to be most accurate or valid. In recognition of the unreliability of such prognostications, a range of futures are conceived and systematically formulated for the purpose of stimulating thought, to arouse discussion, to force exhaustive analyses of basic assumptions and of current and planned

policies and programs, to require the clarification of objectives, to serve as stimuli to action and decision making, to make possible the evaluation and possible re-structuring of priorities, and to identify data needs. Philosophically, the importance of generating alternative futures cannot be overstressed. It serves to overcome technological determinism and drift in social affairs.* Given alternatives, the determination of the future then becomes a human policy and decision-making function. Expert opinion, the Delphi technique, scenarios, and time-series extrapolations lend themselves, among other methods, to the operation of this function.

B. Explore Alternative Pathways to Selected Futures

Assuming a desired future or end-state is selected by the policy makers from among the alternative possibilities, the exploration of the possible alternative routes by which the selected end-state may be attained is carried out. The forecasting methods serve in an iterative process as feedback and feedforward mechanisms linking the present and the future. A selected end-state provides the basis for decision-making in the present. Futures-creating methods may then be utilized in a continuing series to evaluate the results of decisions made and actions taken in the effort to attain the desired goal. On the basis of new concepts of the future using new data, a revised or new end-state may be accepted as the policy goal. Thus, end-states channel current decisions and actions, while the consequences of those decisions and actions serve as a basis for the revision of desired futures. Relevance trees, decision matrices, probabilistic models, and benefit-cost analysis are some examples of the methods which are useful for the investigation of alternative pathways for accomplishing stated goals.

C. Explore Alternative Consequences of Selected Pathways

This function provides systematic procedures and methods for exploring the full range of possible consequences to other variables, programs, processes, etc., after pathways have been selected by policy makers to reach some desired future. This step is particularly difficult in that it implies knowledge of causal relationships among variables. Where causal relationships are not known, however, the ramifying consequences of traveling a particular route can still be explored by the use of probabilistic models, or as in operational simulation or gaming, by allowing "players" to perform different decision-operations sequences in successive "exercises." Where causal chains are better known, other methods,

* On this point see Hasan Ozbekhan, Technology and Man's Future, SP-2494, Santa Monica, California, System Development Corporation, 27 May 1966.

such as deterministic models, input-output tables, or morphological analysis, etc., can be utilized.

D. Conduct a Public Dialogue

The question of which forecasting methods are relevant to and useful for educational policy making cannot be treated independently of the requirement for a public dialogue linking futurists, policy makers, and the public.

It is widely recognized that with increasing specialization there is a growing problem of communication--literally an information and semantic gap--separating, if not alienating, the professional educators involved in policy making and the layman, and there is a similar gap between those professionals of all kinds serving on local school boards and the public. The U.S. Commissioner of Education, Harold Howe II, has noted that while the professional educator and the layman once spoke the same language, this is no longer true. He notes that "today, it is much more difficult to attain the unanimity of the past. Today, in point of fact, it is more difficult for the two even to converse. Can the traditional division of educational responsibility between layman and educator survive, or have we reached the point where our schools must be run by professionals alone?"* Accepting the democratic ideal, the Commissioner concludes that "the ideas of the educator can prevail only if they win the approval of the layman ...."** It is not likely that the current educator-layman relationship will be drastically altered but the Commissioner believes the relationship can be improved "by trying to bridge the gap between the two cultures ...."***

We can add to these observations about the communication problem the fact that contemporary institutional and organizational arrangements make difficult the establishment of common frames of reference, common methodologies for dealing with the future, and common data. Thus a major function of the operational center should be to provide a physical facility within which the makers of educational policy and the public can improve communication.

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* Harold Howe II, "A Nation of Amateurs," Education ... Everybody's Business, Washington, D.C.: U.S. Government Printing Office, 1967, p. 3.

** Ibid, p. 4.

*** Ibid, p. 5.

A concept similar to the one we are suggesting here was recently discussed by Harold D. Lasswell--the "social planetarium."* However, since the subject of concern to us is educational policy making, perhaps an appropriate title for the type of institution we are referring to might be "educational politeum." By analogy to the institution which is used to popularize astronomy, the educational politeum might provide exhibits on the past and present of education and on alternative interpretations of its future. The politeum concept suggests the creation of a public forum for the observation of and discussion about the future of education. The products of conjectures about the future are translated into physical displays. By making it possible to share vital images of the future as distinct from tedious technical monographs, "a basis will be laid for overcoming the ignorance, indifference, and deep incompatability of viewpoints within the body politic."**

E. Conduct Training for Policy Makers

It cannot be assumed that policy makers in all sectors and levels of education are equally familiar with the jargon of futurists, their methods, or the products or outputs of their methods. In addition to the problem of understanding the work of the scientists in the field, the policy makers must themselves be able to make use of futures-creating methodology.

Policy makers in education are not, of course, a homogeneous group. They represent many different sectors and levels of the educational realm. Thus there is a communication problem among policy makers both in the use of a common set of methods for a particular purpose and while participating in the decision-making process. For all these reasons there should be a training function in the operational center. Such methods as brainstorming, scenarios, gaming, and operational simulation can be useful for training purposes. In addition, with appropriate forms of graphic presentation and the use of display devices, other methods such as social accounting, time-series extrapolations, contextual mapping, and decision matrices, can also be employed for training.

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* Harold D. Lasswell, "Do We Need Social Observatories?" Saturday Review, August 5, 1967, pp. 49-52

** Ibid, p. 52.

F. Conduct Research on Selected Problems

A vital function of the operational center should be the conduct of research on issues and problems in education of the future brought to light both by the external scientific community and by the operations of the Center itself. This research capability should include research on both "component" problems which can be treated in relative isolation, such as the future of computer-assisted instruction, and problems which are "integrative" in nature, i.e., changing industrial processes, manpower requirements, and vocational training curricula. Research facilities should be available for the use of policy makers as well as the resident research staff. The resident staff should be experts in the use of the repertoire of futures-creating methods at the Center, and the further development and improvement of those methods should be one of their primary responsibilities.

G. Identify Information Needs

This function is vital to the conduct of policy making in all fields and in education no less than others. It is becoming increasingly evident that a basic problem in policy making is the unavailability of essential data.* One of the special advantages of conjecturing about the future in general and the use of a variety of futures-creating methods in particular is that these activities call attention in a more systematic manner than heretofore to the need for specific kinds of information. Futures-creating methods such as social accounting, morphological analysis, relevance trees, decision matrices, mathematical models, gaming, operational simulation, benefit-cost analysis, and input-output tables are particularly useful for the systematic revelation of data requirements. Futures-creating methods provide theoretical frameworks and analytic categories by means of which data needs can be identified and collected data can be organized and stored.

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* For an extended discussion of this point see R. A. Bauer (ed.), Social Indicators, Cambridge, Mass.: The M.I.T. Press, 1966.

IV. PROVISIONAL EVALUATION OF FUTURES-CREATING METHODS TO SUPPORT CENTER FUNCTIONS

Table 1 presents a matrix which provides an initial and highly provisional evaluation of the potential of the twenty-one methods which are defined in Part II,B, to support the possible operational center functions described in Part III.

As Table 1 indicates, the methods have been subjectively evaluated along a five-point scale from "high" potential utility to "none". By assigning numerical values to the positions on this scale, as indicated by the coding information at the bottom of Table 1, we are able to arrange the method in a rank order as shown in Table 2.

The expected utility of a method was determined in part by whether or not it met the criteria for either or both of the two types of methods defined in Part II.* Additional criteria included: past experience in the use of the method as reported in the published literature, potential transferability of the method to an operational center facility, and the relevance of the method to typical problems and issues in education.**

Having conducted this ranking of methods we must now ask what we have achieved. The ranking reflects the thinking of one individual who is not a specialist in methodology and who has only devoted two months to the study of the subject. The ranking reflects a particular set of experiences and history. It is likely that another investigator with a different background would have produced a different evaluation. He might also have derived a different set of presumed functions for the operational center against which to evaluate the methods. What is required, then, is a broader attack on the question of methods in which a number of specialists from various fields would examine the possible uses for methods in the operational center, perhaps via a Delphi-like technique.

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* A method may be rated "high" if it might conceivably contribute to the public dialogue about the future of education although it would not be so rated if the criteria were only the traditional canons of science.

** Some methods, such as morphological analysis, have been used with apparent success in technological forecasting but the usefulness of the method in the social realm is yet to be demonstrated. Historical sequences may prove to be a useful tool for forecasting in the social realm but it has not been so employed by its developers but, rather, by others in a more superficial fashion.

TABLE 1

INITIAL EVALUATION OF METHODS' POTENTIAL TO SUPPORT POSSIB

Methods for Conjecturing About the Future	Generate Alternative Futures		Explore Alternative Pathways to Futures	Explore Alternative Consequences of Decisions	Enable Informed Public Dialogue
	Likely	Desirable			
1. Brainstorming	high	high	high	low-none	low
2. Delphi-like techniques	high	high	high	low	high
3. Expert opinion	high	high	high-low	low	low
4. Literary fiction	low	low	none	none	low-none
5. Scenarios	high	low-none	high	high	high
6. Historical analogy	low-none	low-none	low-none	none	low-none
7. Historical sequences		low	low-none	none	low-none
8. Content analysis	high-low	high-low	none	none	low-none
9. Social accounting	high	low-none	high	high	high
10. Primary determinant	low-none	high-low	low-none	none	low-none
11. Time-series extrapola.	high	none	high-low	low	high
12. Contextual mapping	high	low-none	high		low
13. Morphological analysis	high	low-none	high	high	
14. Relevance trees	high	none	high	high	low
15. Decision matrices	high-low	high	high	high	low
16. Deterministic models	high	high	high	high	low
17. Probabilistic models	high	high	high	high	low
18. Gaming	high	high	high	high	high
19. Operational simulation	high	high	high	high	high
20. Benefit-cost analysis	low	high	high	high	low
21. Input-output tables	low	high	high	high	low

Code: Expected utility of a method for support of education:

	Numerical v
high	4
high-low	3
low	2

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TABLE 1

DS' POTENTIAL TO SUPPORT POSSIBLE OPERATIONAL CENTER FUNCTIONS

re native ays to es	Explore Alternative Consequences of Decisions	Enable Informed Public Dialogue	Provide Training Services	Conduct Research on Selected Problems		Identify Research & Information Needs	Utility Score
				Component	Integrative		
h	low-none	low	high	low	low-none	high	26
h	low	high	low	high	high	high	32
-low	low	low	low	high	high	high	29
e	none	low-none	none	none	none	low-none	6
h	high	high	high	low	high	high	31
none	none	low-none	none	low-none	low	low	9
none	none	low-none	none	low-none	low	low	9
e	none	low-none	none	high	low-none	high	16
h	high	high	high	low-none	high	high	30
none	none	low-none	none	low-none	low	low	11
-low	low	high	high	high	low	low	25
h		low			high	high	19
h	high		none	high	high	high	25
h	high	low	high-low	low	high	high	27
h	high	low	high-low		high	high	28
h	high	low	high	low	high	high	32
h	high	low	high	low	high	high	32
h	high	high	high	high-low	high	high	35
h	high	high	high	low	high	high	34
h	high	low		low	high	high	26
h	high	low		low	high	high	26

:

	Numerical value
high	4
high-low	3
low	2

	Numerical value
low-none	1
none	0
undecided (blank cell)	0

TABLE 2

RANK ORDER OF FUTURES-CREATING METHODS IN TERMS OF ESTIMATING VALUE IN STIMULATING PUBLIC DIALOGUE*

Forecasting Methods

Gaming
Operational simulation
Delphi technique
Deterministic models
Probabilistic models
Scenarios
Social accounting
Expert opinion
Decision matrices
Relevance trees
Brainstorming
Benefit-cost analysis
Input-output tables
Time-series extrapolation
Morphological analysis
Contextual analysis
Content analysis
Primary determinant
Historical analogy
Historical sequences
Literary fiction

* It should be emphasized, again, that this particular rating of the methods reflects an emphasis upon "public dialogue" as a major feature of the operational center. A different emphasis, such as a concern with anticipating the unexpected, would result in a different rating. Literary fiction, for example, would have a higher rating in the latter case. Note also that the five highest ranking methods lend themselves to well-controlled replications while the lowest five depend heavily on individualistic interpretations of data.

The ranking may be misleading in that the utility score (the right-hand column in Table 1) is a sum of presumed utilities of a method for nine functions of an operational center. This tells us that some methods can be used for more purposes than others. But the value of a method for one Center function may be much greater, depending upon Center objectives, then the total values of other methods for several functions.

Furthermore, the value of a method may be altered when it is examined, not by itself, but as one step in a logically sequenced combination or string of methods.

V. METHOD STRINGS

It should not be inferred from the treatment up to this point of futures-creating methods as separate elements that each method will invariably be used independently in the operational center. For some types of component problems, of course, a given method, such as time-series extrapolation, may be used by itself. But for many of the objectives of an operational center for educational policy making, strings of methods will be needed. One method may be used to provide inputs to the operation of another method, while a third method may be used to evaluate the outputs of the previous methods employed. Examples of such applications of method strings may be found in Honeywell's PATTERN and the System Development Corporation's System Training Program (STP) for the U.S. Air Force. PATTERN makes use of scenarios, time-series extrapolations, relevance trees, decision matrices, and deterministic models. A typical STP exercise includes scenarios, deterministic models, operational simulation, and brainstorming.

Indeed, our investigation of methods has revealed that while the evaluation of individual methods is an important issue, a heretofore badly neglected problem is to determine which combination of methods can be used and how shall they be combined in order to deal most effectively with the future of a specific aspect of society and/or education. A logical procedure is helpful to begin this task.

We have already noted that different methods lend themselves to different purposes by correlating methods with potential Center functions. However, the past use of method strings suggests that methods may also be correlated with steps or stages in the typical problem-solving sequence. This sequence includes the following steps:*

- identification of the problem
- analysis of the problem
- synthesis of possible solutions
- evaluation of alternative solutions
- judgment or the selection of a preferred solution

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* See, for example, John Dewey, How We Think, Boston: D. C. Heath, 1910; Morris Asimow, Introduction to Design, Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962, pp. 20-23.

Thus some methods are more useful than others in identifying problems, while others are most effective for conducting analyses, and still others are most useful in evaluating alternative courses of action, and so on. The implication of this is that the operational center should have at its command a repertoire of methods which, in addition to providing support for particular Center functions, could be brought to bear depending upon the stage in the problem-solving process engaging the attention of the policy makers.

The operation of a Center function, such as "generate likely alternative futures," and the problem-solving sequence described above suggest the application of a particular method string. This is illustrated in the following Table:

TABLE 3

SUPPORT FUNCTIONS OF METHOD STRINGS

Operational Center Function	Problem-Solving Stage	Forecasting Method
Generate Likely Alternative Futures	Identify problems	Scenarios/Expert Opinion
	Analysis	Benefit-cost analysis
	Synthesis	Probabilistic models
	Evaluation	Gaming
	Judgment	Delphi technique

The arrangement of methods in strings is also related to another vital function of the operational center which we have stressed -- to enable informed public dialogue. Creating the future is a process and methods merely facilitate that process. R. E. Bickner has described this process succinctly: "...the future is not a total design fabricated at an instant in time by a collective conscious, but rather the continuously remolded product of endless and innumerable pushes and pulls from a diverse multitude."* Methods serve to provide the substantive data, the concepts, and the theories around which this struggle occurs while the Center provides the place.

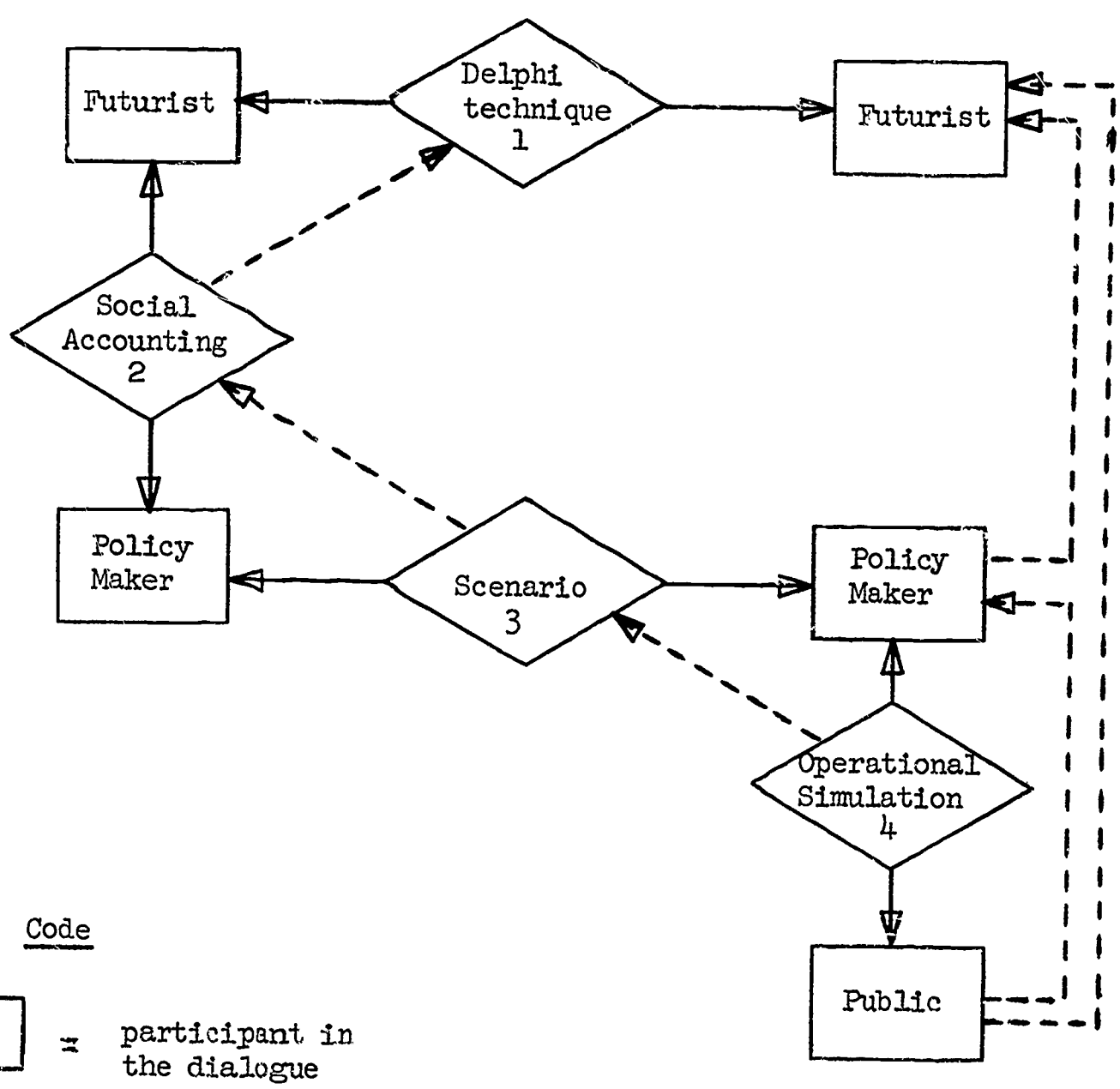
* In a letter to M. Adelson, dated August 9, 1967.

The possible interactions among futurists, policy makers, and the public and the use of method strings is illustrated in Figure 1. The Figure indicates that futurists may employ the Delphi technique to explore alternative desired futures; the futurists may present to policy makers the alternative consequences of specific futures via a social accounting method; policy makers may investigate alternative pathways to a specific future using prepared scenarios; and, finally, operational simulation may be employed by the policy makers to conduct an informed dialogue with the public about preferred futures and recommended pathways to reach them. The dashed lines in the Figure suggest two types of feedback loops; one string of loops connecting the participants in the dialogue, and another set connecting the methods. The feedback loops linking the participants in the public dialogue contribute to the future creating process referred to above. The operational center must provide the facilities, the display mechanisms, and the procedures whereby the various participants can react to the ideas and concepts about the future of education generated by other parties to the dialogue.

By the same token, procedures must be established whereby the outcomes of a method such as operational simulation (see Figure 1) are translated into inputs for the design of another round of scenarios. Similarly the creation and use of scenarios raises a host of questions and issues about neglected aspects of society which can be presented to the designers of social accounting schemes to assure a more complete social "profile". And the use of a social accounting scheme will suggest in a systematic fashion sets of social issues which can provide the basis for questions to be explored via the Delphi technique.

The full power of methods for conjecturing about the future and achieving desired futures will probably not be attained via the development of any one particular method or number of methods conceived independently but, more likely, by the ultimate creation of method strings.

METHOD STRINGS AND THE INFORMED PUBLIC DIALOGUE



Note: Futurists, policy makers, and the public comprise three levels. Interaction occurs within each level and between different levels, and appropriate methods are used for each type of interaction.

Figure 1

VI. THE NEXT STEP

This paper has described the results of the first step in the investigation of forecasting methods--to determine their utility for the purposes of the SDC Pilot Center and to serve the possible future needs of the operational centers. A set of selected methods has been evaluated systematically with respect to potential operational center functions. The concept of method strings has been presented and it has been indicated how such strings are related to Center functions and the typical problem-solving process.

During the months of September and October the emphasis in the investigation of methods will shift from a concern with the utility of the methods for the support of operational center functions to the substantive concepts, trends, and data produced by selected methods. The methods will be selected from among the following: Delphi-like techniques, scenarios, expert opinion, brainstorming, time-series extrapolation, content-analysis, and historical sequences. These methods have been chosen since they have been used more extensively than others in efforts to forecast socio-cultural phenomena of direct relevance to this project and the results of these efforts are more readily available.* The objective of this phase will be to examine the scope and degree of disagreements, convergences, similarities, and inconsistencies in the substantive findings among the methods studied and among multiple applications of the same method.

The substantive societal trends forecasted and conjectured about by the applications of the methods will be compiled and their implications for the future educational environment will be explored. These activities will be preliminary to an intensive study at a later date of the future roles of educators.

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* Scenarios recently created by the Hudson Institute are now available.

APPENDIX B

THE USE OF CONTEXTUAL MAPPING TO SUPPORT LONG-RANGE EDUCATIONAL POLICY MAKING

by

Perry E. Rosove

TABLE OF CONTENTS

FIGURES

I. INTRODUCTION

This report presents the results of a continuing investigation into the methodology of conjecturing about the future. It describes the structure and content of a "contextual map," one of the twenty-one methods used in the study of the future which were identified, defined, and evaluated in a previous progress report.[1] A contextual map may be defined as a graphic display of the logical and causal dependencies of functionally related phenomena. Part II of this report describes the structure and content of the map we have developed.

The idea that the method of contextual mapping would be a very useful approach, with many long-range potentials, emerged first out of the review of this method by Erich Jantsch and his comments about its potential utility.[2] Jantsch's closing remarks about contextual mapping are worth quoting here:

> "This aspect of exploratory forecasting seems to have been applied very successfully. In the absence of systematic large-scale normative forecasting in areas other than advanced technical development, contextual mapping has not yet received the full attention which it deserves. It is considered of potential value within the framework of social technology."

The decision to make use of a contextual map as a device for coming to grips with the substantive problems of social trends, the future of education, and the possible roles of educators in 1988 was reached as we acquired some first-hand knowledge of the forecasting state of the art; as we studied the documents of the Hudson Institute and participated in the Institute's seminar; as we read the literature dealing with social trends; and as we attempted to cope with what we regarded as a basic issue--how to use the forecasting state of the art in the context of a public debate, in a public forum or "educational politeum."[3]

Our growing belief in the utility of the method received additional impetus following a visit to SDC by Erich Jantsch on October 24 when we had the opportunity to show our map layout to him and to review with him its possible uses for educational policy making.

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[1] Progress Report: Educational Policy Research and Support Center, Appendix 4.4 (TM(L)-3645/000/00. Santa Monica: System Development Corporation, August 1967).

[2] Erich Jantsch, "Time-independent contextual mapping," Technological Forecasting in Perspective, Section II. 3.5 (Paris: O.E.C.D., October 1966), pp. 178-181.

[3] Progress Report, op. cit., p. 20.

The decision to employ and experiment with a contextual map for the purposes of the SDC Pilot Center does not imply that other methods--time-series extrapolations, scenarios, relevance trees, etc.--are not equally valuable. As we noted in our previous report, any evaluation of a method depends upon the purposes for which it is used and how its power may be enhanced in combination with other methods. There are, however, several reasons why our energies and resources were put into the effort described herein. These reasons may be briefly summarized. Contextual mapping would assist an operational center to:

- generate alternative futures
- explore alternative pathways to selected futures
- explore alternative consequences of selected pathways
- co uct a public dialogue
- conduct training for policy makers
- conduct research on selected problems
- identify information needs.

Other advantages which we believe are inherent in the contextual mapping approach include the following. It

- makes social trend analysis a public rather than a private function through public display of the trends, as such, and it facilitates open discussion of the analyst's theories, assumptions, and biases
- provides a more usable basis for familiarization of policy makers with developing trends (reduces information overload)
- contributes to the determination of what individuals and organizations want for the future by identifying issues and problems
- facilitates and depends upon a systemic point of view and is, therefore, a useful interdisciplinary tool
- maximizes the power of different methods for conjecturing about the future by applying the concept of the method string.

Part III presents in detail the reasons why we decided to develop a contextual map and, at the same time, reviews the potential value of such mapping for an operational center.

It should be noted that this report is concerned primarily with conjectures about the future which are based on the extrapolation of trends. T. B. Robertson's work is concerned with what individuals or organizations want for the future and is reported elsewhere (see Appendix D). However, some overlap between these two approaches to the study of the future is briefly reviewed in this report. Although a contextual map is constructed using trend extrapolations, its nature is such that it also lends itself to the formulation of normative projections in a public context. It is this fact, among others, which makes the use of contextual mapping so potentially valuable for long-range policy making.

The map described in this report is about half completed at this time. It will be completed in the remaining months of the Pilot Center project.

II. STRUCTURE AND CONTENT OF THE CONTEXTUAL MAP

A. Map Structure

The contextual map is composed of a two-dimensional matrix containing 36 cells (see Figure 1). The vertical axis of the matrix is divided into rows, each of which represents functionally distinctive phenomena--the basic, long-term trends of Western civilization. These trends have been adapted from the work of the Hudson Institute.* Five trends were selected since it appeared that they were particularly rich in possible implications for education. The trends are:

- Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture;
- Transitional, mass-consumption society characterized by higher GNP and personal incomes, affluence (among the better educated);
- World-wide industrialization and modernization;
- Institutionalization of change, especially through research, development, innovation and organized diffusion;

*See Herman Kahn and Anthony J. Wiener, The Year 2000: A Framework for Speculation on the Next Thirty-three Years, Vol. II of the working papers of the Commission on the Year 2000 (Croton-on-Hudson: Hudson Institute, Inc., 1967), Chapter I.

Basic, Long-term Trends	Major Sub-Trends	Social and Technical Implications	Implications for Education	Educational Functions	Possible Future Roles	Major Issues
(Cultural Sector) Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture.	1A	2A	3A	4A	5A	6A
(Socio-cultural Sector) Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture.	1B	2B	3B	4B	5B	6B
(Economic Sector-National) Transitional, mass-consumption society characterized by higher GNP and personal incomes, affluence (among better educated).	1C	2C	3C	4C	5C	6C
(Economic Sector-International) World-wide industrialization and modernization.	1D	2D	3D	4D	5D	6D
(Science & Technology Sector) (I Organization) Institutionalization of change, especially through research, development, innovation & organized diffusion.	1E	2E	3E	4E	5E	6E
(Science & Technology Sector) (II Information) Accumulation of scientific and technological knowledge.	1F	2F	3F	4F	5F	6F

FIGURE 1. AN EPRSC CONTEXTUAL MAP (ROLES)

- Accumulation of scientific and technological knowledge.

For the sake of facilitating the mapping of functionally related phenomena, we have grouped the trends into three major "sectors" and identified a total of six sub-sectors as rows of the matrix: cultural, socio-cultural, economic-national, economic-international, science and technology-organization, and science and technology-information.

Phenomena within a row are more closely related than phenomena among different rows. However, since the rows represent concepts, they should be recognized for what they are--convenient abstractions which help organize otherwise apparently disparate data. There is much overlap between and among the rows. Obviously developments which occur within the sector of science and technology affect in a variety of ways developments in the economic sector. Similarly, events and trends in the economic sector affect the socio-cultural sector. These interdependencies are not easy to show in a two-dimensional matrix. However, we have attempted to represent them in Figures 2 and 3 by a dot-dash line.

The horizontal axis of the matrix is divided into six columns which are designed to show the logical and causal sequences of events, trends, conditions, and processes dependent upon the basic, long-term trends. The six columns include:

- Major Sub-trends
- Social and Technical Implications
- Implications for Education
- Educational Functions
- Possible Future Roles (for educators)
- Major Issues

The selection of these column headings reflects both a logical order and the substantive concerns of the SDC Pilot Center effort, i.e., the implications of social and technical trends for society, education, and the roles of educators.

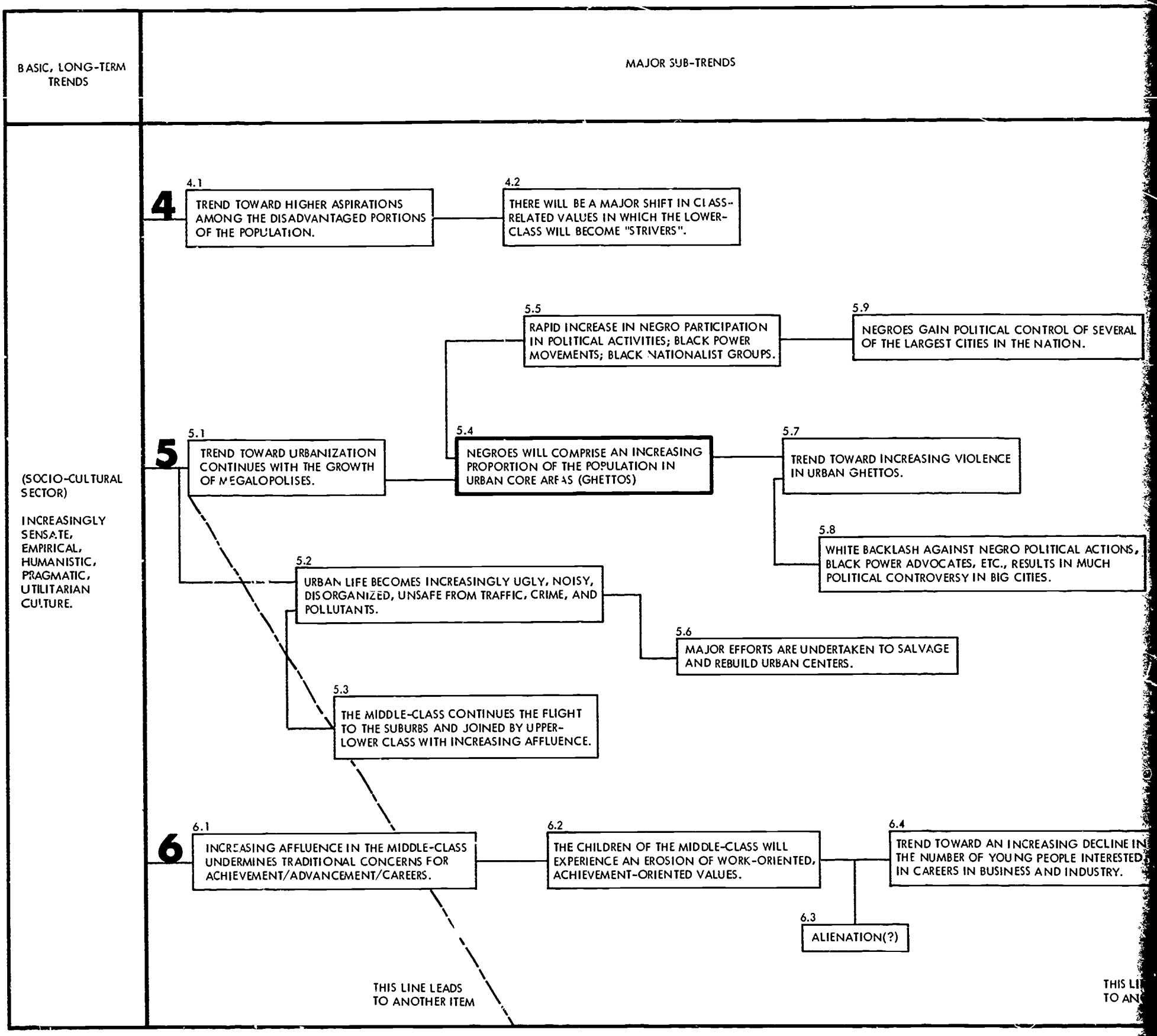
The contextual map illustrated in Figure 1 is a physical wall display presently located in the SDC EPRSC library. Its dimensions are 98 inches wide by 50 inches high. Each of the 36 cells in the matrix measures 14.5 inches by 7.5 inches. The display is currently in use as a method to derive the possible roles of educators in the late 1980's.

Figures 2 and 3 provide graphic illustrations of the detailed structure of the contextual map. Figure 2 portrays cells 1 B through 6 B, the extrapolated consequences of the basic, long-term trend: "Increasingly Sensate, Empirical, Humanistic, Pragmatic, Utilitarian Culture (Socio-Cultural Sector)." Figure 3 portrays cells 1 D through 6 D, the extrapolated consequences of the basic, long-term trend: "World-Wide Industrialization and Modernization (Economic Sector-International)."

Trends, events, conditions, and processes are represented in each cell of the matrix by "entries." Each entry is enclosed in a rectangular box. Functionally related entries are identified by the same numeral across an entire row of the map. There are a total of 18 functional sets, three in each of the six rows. Figures 2 and 3 illustrate sets 1 through 6. Entries which are regarded to be especially important are set off from other entries by heavy black boxes. The lines joining the entries indicate logical and causal dependencies. Time is represented by the flow of boxes from left to right. The heavier black lines linking boxes indicate alternative trend possibilities. The dashed lines suggest possible interdependencies. A dot-dash line is used to show interdependencies between and among different rows of the matrix.

Note in Figures 2 and 3 that each entry is identified by a number, e.g., 5.1, 5.2, 5.3, etc. The number before the period identifies the functional set to which the entry belongs; the number after the period identifies the entry's sequence in that set. Such identifications make easy reference to each entry possible and also provide a basis for associating an entry with other data or information available to the EPRSC such as the automated bibliographic data base, demographic computer models, and statistical data available in literature sources. At this point in time these associations are merely potentialities of this approach; they have not yet been constructed. Carrying out this development would be properly a function of the operational center. However, there are no serious technical problems involved in building such a capability.

It should be pointed out that the actual map in use at SDC is coded in color. For example, entries are pinned to the map with red tacks to indicate they are critical; blue tape is used to show logical and causal dependencies. Figures 2 and 3 show the same structural features of the actual map but have been changed as described above for the purposes of reproduction in black and white.


BASIC, LONG-TERM TRENDS
MAJOR SUB-TRENDS
(SOCIO-CULTURAL SECTOR)
INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE.
4
4.1
TREND TOWARD HIGHER ASPIRATIONS AMONG THE DISADVANTAGED PORTIONS OF THE POPULATION.
4.2
THERE WILL BE A MAJOR SHIFT IN CLASS-RELATED VALUES IN WHICH THE LOWER-CLASS WILL BECOME "STRIVERS".
5
5.1
TREND TOWARD URBANIZATION CONTINUES WITH THE GROWTH OF MEGALOPOLISES.
5.2
URBAN LIFE BECOMES INCREASINGLY UGLY, NOISY, DISORGANIZED, UNSAFE FROM TRAFFIC, CRIME, AND POLLUTANTS.
5.3
THE MIDDLE-CLASS CONTINUES THE FLIGHT TO THE SUBURBS AND JOINED BY UPPER-LOWER CLASS WITH INCREASING AFFLUENCE.
5.4
NEGROES WILL COMPRISE AN INCREASING PROPORTION OF THE POPULATION IN URBAN CORE AREAS (GHETTOS)
5.5
RAPID INCREASE IN NEGRO PARTICIPATION IN POLITICAL ACTIVITIES; BLACK POWER MOVEMENTS; BLACK NATIONALIST GROUPS.
5.6
MAJOR EFFORTS ARE UNDERTAKEN TO SALVAGE AND REBUILD URBAN CENTERS.
5.7
TREND TOWARD INCREASING VIOLENCE IN URBAN GHETTOS.
5.8
WHITE BACKLASH AGAINST NEGRO POLITICAL ACTIONS, BLACK POWER ADVOCATES, ETC., RESULTS IN MUCH POLITICAL CONTROVERSY IN BIG CITIES.
5.9
NEGROES GAIN POLITICAL CONTROL OF SEVERAL OF THE LARGEST CITIES IN THE NATION.
6
6.1
INCREASING AFFLUENCE IN THE MIDDLE-CLASS UNDERMINES TRADITIONAL CONCERNS FOR ACHIEVEMENT/ADVANCEMENT/CAREERS.
6.2
THE CHILDREN OF THE MIDDLE-CLASS WILL EXPERIENCE AN EROSION OF WORK-ORIENTED, ACHIEVEMENT-ORIENTED VALUES.
6.3
ALIENATION(?)
6.4
TREND TOWARD AN INCREASING DECLINE IN THE NUMBER OF YOUNG PEOPLE INTERESTED IN CAREERS IN BUSINESS AND INDUSTRY.
THIS LINE LEADS TO ANOTHER ITEM
THIS LI
TO AN
EXTRAPOLATED C
INCREASINGLY SENSATE, EM

SOCIAL AND TECHNICAL
IMPLICATIONS

4.3
4 INCREASING SPECIALIZATION IN NARROWLY DEFINED TASKS WILL REMAIN AS A BASIS FOR THE SOCIAL MOBILITY OF "STRIVERS" IN THE LOWER-CLASS--NEGROES AND OTHERS.

4.4
MAJOR SEGMENTS OF THE POPULATION, INCLUDING WOMEN, WILL EMPLOY AVAILABLE TIME TO EARN ADDITIONAL INCOME FOR THE PURCHASE OF NON-ESSENTIAL, LUXURY ITEMS.

SEVERAL

5.13
RISING CRIME RATES

5.11
MAJOR EFFORTS SPONSORED BY FEDERAL AND STATE AUTHORITIES TO FIND JOBS FOR THOSE HANDICAPPED BY INABILITY TO WORK WITH SYMBOLS.

5.14
TREND TOWARD CENTRALIZATION OF POWER TO COPE WITH URBAN PROBLEMS AND TO CONTROL VIOLENCE.

CTIONS,
CH

5.10
5 THE CULTURALLY DISADVANTAGED WILL FIND THEMSELVES INCREASINGLY DISADVANTAGED IN A WORLD CHARACTERIZED BY SYMBOL MANIPULATION.

5.12
THERE WILL BE VARIOUS TYPES OF SOCIAL PROTEST AND REBELLION (USE OF DRUGS, DROP-OUTS, RIOTS, ANTI-ESTABLISHMENT MOVEMENTS, LITERATURE, ETC.)

5.15
TREND TOWARD "PARTICIPANT DEMOCRACY" TO INVOLVE STUDENTS AND OTHER DISSIDENT GROUPS IN DECISION MAKING.

6.6
THE USE OF DRUGS AND OTHER FORMS OF ESCAPIST ACTIVITIES INCREASE AMONG YOUTH OF URBAN GHETTOS AND AFFLUENT SUBURBS AND COLLEGES.

6.9
EMERGENCE OF AN EXTENSIVE UNDERGROUND MOVEMENT AND STUDENT SPONSORED "FREE" UNIVERSITIES IN MIDDLE-CLASS ENVIRONMENTS.

ECLINE IN
NTERESTED
USTRY.

6.5
6 IDEA OF THE "TWO FAMILY FAMILY". (BEGIN SECOND FAMILY AFTER 40 IF AFFLUENT AND LONELY ENOUGH.)

6.8
WITH INCREASING LEISURE, GREATER AFFLUENCE, AND TWO FAMILY FAMILY CONCEPT, POPULATION CONTINUES RAPID GROWTH.

6.10
A CULTURAL EXPLOSION.

6.7
INCREASE IN AVERAGE LONGEVITY.

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

FIGURE 2.

OLATED CONSEQUENCES OF BASIC, LONG-TERM TREND.
NSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE
(SOCIO-CULTURAL SECTOR)

BASIC, LONG-TERM TRENDS

IMPLICATIONS FOR EDUCATION

(SOCIO-CULTURAL SECTOR)

INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE

4

4.5 NEW TYPES OF CAREERS, CAREER LADDERS, AND ACHIEVEMENT STANDARDS WILL HAVE TO BE DEVELOPED FOR A WIDE VARIETY OF SUB-PROFESSIONALS (TEACHER'S AIDES, ETC.).

4.9 VOCATIONAL EDUCATION MUST BE INCREASED IN SCOPE TO MEET THE NEEDS OF STRIVERS.

4.8 VOCATIONAL EDUCATIONAL PROGRAMS AND CURRICULA WILL HAVE TO BE ADAPTED TO NEEDS OF PERSONS WITH INADEQUATE SYMBOL-USE CAPABILITY.

4.10 REQUIREMENT FOR INSTITUTIONAL CHANGES, I.E., APPRENTICESHIP PROGRAMS FOR DISADVANTAGED IN CRAFT AND OTHER INDUSTRIES.

4.11 POSSIBLE USE OF RETIRED MILITARY PERSONNEL, MEN ON PROBATION, EX-CRIMINALS AS INSTRUCTORS AND GROUP LEADERS.

4.7 ALTERNATING EDUCATION AND WORK

4.6 EARLIER EDUCATION FOR URBAN YOUTH

5.20 A MORE ECLECTIC, EMPIRICAL APPROACH TO EDUCATION. WHAT WORKS WILL BE INSTITUTIONALIZED, USE OF STORES AS CLASSROOMS, CAMPS, EMPLOYER'S FACILITIES, COMMUNITY SERVICE CENTERS, ETC., AS LOCI FOR LEARNING.

5.21 CERTIFICATION REQUIREMENTS FOR TEACHERS WILL BECOME INCREASINGLY FLEXIBLE; IN SOME SYSTEMS, A BA DEGREE WILL SUFFICE WHILE IN OTHERS, OLDER STUDENTS WILL TEACH YOUNGER ONES.

5.17 EDUCATIONAL PROCESS MUST BE REDESIGNED SO THAT MINORITY GROUP CHILDREN ARE NOT DEPRIVED FROM FULL PARTICIPATION IN SOCIETY.

5

5.16 EDUCATIONAL QUALITY WILL CONTINUE TO DETERIORATE IN THE URBAN GHETTO.

5.19 INCREASING EFFORTS TO DEVELOP EDUCATIONAL PROGRAMS WHICH WILL MAKE THE EDUCATIONAL PROCESS RELEVANT TO THE LIFE EXPERIENCE OF THE STUDENT FROM URBAN GHETTOS.

5.23 EDUCATION WILL HAVE TO DEAL WITH THE POLARIZATION OF SOCIETY: A HIGHLY EDUCATED "MERITOCRACY" VS AN UNSKILLED UNEDUCABLE MINORITY.

5.18 EARLY WARNING SYSTEMS TO IDENTIFY POTENTIAL DROPOUTS FROM THE EDUCATIONAL PROCESS SHOULD BE DEVELOPED.

5.22 STUDENT PARTICIPATION IN ADMINISTRATIVE MATTERS WILL INCREASE; STUDENT REPRESENTATIVES WILL SERVE ON FACULTY AND ADMINISTRATIVE BODIES.

6.12 EDUCATION WILL HAVE TO SERVE THE NEEDS OF A GREATER SPREAD OF POPULATIONAL TYPES IN TERMS OF AGE - YOUNGER, MIDDLE, OLDER.

6.15 INCREASE IN EARNING OF HIGHER DEGREES AMONG AFFLUENT.

6

6.11 THERE WILL BE A NEED FOR DIVERSE TYPES OF EDUCATIONAL INSTITUTIONS AND PROGRAMS TO SATISFY THE REQUIREMENTS OF DIFFERENT SEGMENTS OF THE POPULATION--DIFFERING IN SKILLS, MOTIVATIONS, CAREER OBJECTIVES, AGE LEVELS, ETC.

6.13 AROUND-THE-CLOCK USE OF EDUCATIONAL FACILITIES, PARTICULARLY FOR INDIVIDUAL USE OF CAI, FILMS, T.V., ETC.

6.16 EDUCATIONAL REQUIREMENTS FOR THE ARTS PRODUCERS FOR THE CULTURAL EXPLOSION.

6.14 THE TEACHING FUNCTION IS SEPARATED FROM THE RESEARCH AND PUBLISHING FUNCTION.

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LE
TO ANOTHER

EXTRAPOLATED CO
INCREASINGLY SENSATE, EMP

EDUCATIONAL FUNCTIONS

4

4.12 DESIGNING COMPENSATORY PROGRAMS IN USE OF SYMBOLS (MATH AND ENGLISH) FOR CULTURALLY DISADVANTAGED.

4.13 OPERATING COMPENSATORY PROGRAMS IN USE OF SYMBOLS (MATH & ENGLISH) FOR CULTURALLY DISADVANTAGED.

5.26 DEVELOPING THE PHILOSOPHY FOR BALANCED EDUCATIONAL PROGRAMS TO SATISFY INDIVIDUAL NEEDS AND SATISFY SOCIAL NEEDS FOR TECHNICALLY TRAINED PEOPLE.

5.28 DESIGNING BALANCED EDUCATIONAL PROGRAMS TO SATISFY INDIVIDUAL NEEDS AND SATISFY SOCIAL NEEDS FOR TECHNICALLY TRAINED PEOPLE.

5

5.24 DEFINITION AND CLARIFICATION OF THE VARIED GOALS OF EDUCATION.

5.27 GOAL COORDINATION AT LOCAL, STATE, AND NATIONAL LEVELS.

5.29 NATIONAL AND EDUCATIONAL GOALS MUST BE BALANCED AGAINST NATIONAL RESOURCES AND ALLOCATION OF SCARCE RESOURCES IN TERMS OF SELECTED PRIORITIES.

5.25 BARGAINING AND NEGOTIATING WITH COMPETING POWER GROUPS: STUDENT DEMONSTRATORS, TEACHERS UNIONS, PARENTS ASSOCIATIONS, TECHNOLOGISTS, WHITE-COLLAR EMPLOYEES, ETC.

5.30 PRESENTATION TO REPRESENTATIVE AUDIENCES OF ALTERNATIVE GOALS, PRIORITIES, RESOURCE PROBLEMS FOR POLICY DECISIONS.

6

6.18 PLANNING AND DEVELOPING EDUCATIONAL PROGRAMS RICH IN CULTURAL CONTENT FOR INDIVIDUALS AT ALL LEVELS OF EDUCATION, INCLUDING ADULTS

6.17 DESIGNING COMPENSATORY PROGRAMS IN THE WORLD OF WORK FOR REALITY DISADVANTAGED, MIDDLE-CLASS ACADEMICALLY ORIENTED STUDENTS.

6.20 PLANNING THE USE OF EDUCATIONAL FACILITIES 24 HOURS PER DAY, 365 DAYS PER YEAR.

6.21 OPERATING EDUCATIONAL FACILITIES 24 HOURS PER DAY, 365 DAYS PER YEAR.

6.22 CONTRIBUTING TO THE LEARNING PROCESS (TEACHING?)

6.19 PLANNING AND CONDUCTING RESEARCH

(Continued)

OF BASIC, LONG-TERM TREND.
NISTIC, PRAGMATIC, UTILITARIAN CULTURE
URAL SECTOR)

BASIC, LONG-TERM TRENDS

(SOCIO-CULTURAL SECTOR)

INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE

POSSIBLE FUTURE ROLES

4

4.16 ONE-TO-ONE TUTORS - THOSE WHO ASSIST IN THE EDUCATION AND GUIDANCE OF UNIQUE LEARNERS AT OPPOSITE ENDS OF THE CAPABILITY SPECTRUM - THE UNUSUALLY DISADVANTAGED AND THE UNUSUALLY GIFTED

4.14 SPANNERS - THOSE WHO BRIDGE EDUCATIONAL GAPS BETWEEN TEACHERS AND STUDENTS, MORE ADVANCED AND LESS ADVANCED LEARNERS, I.E., AN 8TH GRADE STUDENT TEACHING A 6TH GRADE STUDENT, OR THE EQUIVALENT OF GRADE LEVELS.

4.15 VOCATIONAL TRAINING/CAREER SPANNERS - THOSE WHO ASSIST VOCATIONAL EDUCATION STUDENTS BRIDGE THE GAP BETWEEN EDUCATION AND WORK.

4.17 HIGH PERFORMANCE EDUCATORS - THOSE HIGHLY QUALIFIED TEACHERS TRAINED SPECIFICALLY TO FACILITATE LEARNING PROCESSES AMONG THE DISADVANTAGED IN URBAN GHETTO ENVIRONMENTS.

4.18 UNCREDENTIALED TEACHERS - THOSE WHO HAVE HAD APPROVED COLLEGE-LEVEL TRAINING ADEQUATE TO PROVIDE LEARNING ENVIRONMENTS AND PROCESSES FOR THE DISADVANTAGED IN URBAN GHETTO ENVIRONMENTS.

4.19 SUPERVISOR/TRAINERS - THOSE WHO PROVIDE BOTH SUPERVISION AND TRAINING FOR YOUNG PEOPLE IN ON-THE-JOB LEARNING SITUATIONS. (NOTE: THE IMPLICATION OF THIS ROLE IS AN ORGANIZATIONAL OVERLAP BETWEEN PRIVATE INDUSTRY AND THE FORMAL EDUCATIONAL SYSTEM.)

4.20 COLLEGE STUDENT ASSISTANTS - THOSE COLLEGE STUDENTS WHO WILL BE PAID MINIMAL SALARIES TO WORK WITH HIGH-SCHOOL LEVEL OR YOUNGER STUDENTS WHO REQUIRE COMPENSATORY PROGRAMS IN URBAN GHETTO ENVIRONMENTS.

4.21 PSYCHIATRIC AIDES - THOSE PERSONNEL TRAINED IN PSYCHIATRY OR CLINICAL PSYCHOLOGY WHO ASSIST EDUCATORS WITH PUPILS SUFFERING FROM PSYCHOLOGICAL OBSTACLES TO LEARNING.

5

5.31 EDUCATIONAL FUTURISTS - THOSE WHO SYSTEMATICALLY EXPLORE THE IMPLICATIONS OF CONJECTURES ABOUT THE FUTURE FOR EDUCATIONAL PURPOSES.

5.32 COMMUNITY REPRESENTATIVE - THOSE PERSONS CHOSEN BY THE LOCAL COMMUNITY TO REPRESENT THE COMMUNITY IN MEETINGS AND CONFERENCES WITH THE LOCAL EDUCATORS.

5.33 EDUCATION ARCHITECTS - THOSE WHO DESIGN THE FACILITIES, PLANTS, EDIFICES, ETC., IN WHICH INDIVIDUAL, GROUP, AND COMMUNITY-WIDE LEARNING EXPERIENCES CAN OCCUR.

5.34 GUIDANCE COUNSELORS - THOSE WHO ASSIST ACADEMICALLY-ORIENTED STUDENTS WITH EDUCATIONAL PLANS, AND JOB-ORIENTED STUDENTS WITH NEEDED QUALIFICATIONS AND TRAINING FOR JOB GOALS.

5.35 TECHNICAL ASSISTANTS - THOSE WHO ASSIST IN THE LEARNING PROCESS BY PROVIDING SPECIALIZED KNOWLEDGE IN THE USE OF EQUIPMENT WHICH CONVEYS INFORMATION SUCH AS AUDIOVISUAL AIDS, FILMSTRIPS, PROGRAMMED INSTRUCTION, ETC.

6

6.23 MASTER TEACHER - THOSE HIGHLY QUALIFIED EDUCATORS WHO LEAD TEACHING TEAMS AND SUPERVISE UNCREDENTIALED TEACHERS, ASSISTANT TEACHERS, STUDENT TEACHERS, TECHNICAL ASSISTANTS, ETC.

6.24 STUDENT TEACHERS - THOSE STUDENTS ACQUIRING A BACCALAUREATE DEGREE WITH THE GOAL OF BECOMING PROFESSIONAL TEACHERS WHO ASSIST THE LEARNING PROCESS UNDER THE DIRECTION OF PROFESSIONALS. (NOTE: THIS ROLE IS NOT LIMITED TO A "TEACHER'S COLLEGE" - ANY LIBERAL ARTS STUDENT WOULD BE ELIGIBLE.)

6.25 COMMUNITY EDUCATION COORDINATORS - THOSE WHO PLAN, COORDINATE, AND MANAGE MULTIPLE AND DIVERSE EDUCATIONAL PROGRAMS SERVING A COMMUNITY IN THE LOCAL SCHOOL OR AN EQUIVALENT LEARNING ENVIRONMENT.

6.26 PROGRAM EVALUATORS - THOSE WHO EVALUATE NON-FORMAL, WORK-ORIENTED, OR COMMUNITY ACTIVITIES FOR THEIR CONTRIBUTIONS TO A STUDENT'S EDUCATIONAL GOALS AND EDUCATIONAL STANDING (ACCREDITATION).

6.27 COMMUNITY CURRICULUM DESIGNERS - THOSE WHO ON-THE-JOB, COMMUNITY ACTION, APPRENTICE AND OTHER TYPES OF LEARNING EXPERIENCES WHICH OCCUR OUTSIDE OF FORMAL EDUCATIONAL INST

6.28 CREDENTIALS EXPERTS - THOSE WHO HAVE THE TRAINING AND OFFICIAL AUTHORITY TO TRANSLATE WIDE VARIETIES OF WORK AND LEARNING EXPERIENCES INTO FORMALLY ACCEPTABLE CRITE FOR INDIVIDUAL PROGRESSION, AWARD OF CERTIFICATES, GRADUATION, ETC

EXT
INCREASINGLY

MAJOR ISSUES

4

4.22 HOW SHALL EDUCATION IN THE 1980'S BE ORGANIZED TO ACCOMODATE VOCATIONALLY-ORIENTED STUDENTS AND ACADEMICALLY-ORIENTED STUDENTS? SHOULD VOCATIONAL EDUCATION BE BASED ON A POLICY OF "SEPARATISM" OR "APARTHEID"? HOW CAN A NEW EMPHASIS ON VOCATIONAL TRAINING BE RECONCILED WITH RAPID JOB OBSOLESCENCE?

4.23 HOW CAN THE NEED OF "STRIVERS" FROM THE URBAN GHETTOS FOR JOBS BE RECONCILED WITH THE GOAL OF "TEACHING STUDENTS HOW TO LEARN"?

4.24 SHOULD EDUCATION CONTRIBUTE TO THE POLARIZATION OF SOCIETY BY CATERING TO THE NEEDS OF URBAN GHETTO "STRIVERS" FOR JOBS AND THE NEEDS OF THE AFFLUENT FOR "CULTURE" AND INDIVIDUAL SELF-FULFILLMENT?

4.25 IS THE CURRENT EDUCATIONAL SYSTEM CAPABLE OF MOUNTING MASSIVE ATTACKS ON SUCH PROBLEMS AS EDUCATING THE GHETTO ILLITERATES, ADULT ILLITERATES, MAKING THE DISADVANTAGED EMPLOYABLE, ETC.?

4.26 SHOULD EXISTING TEACHERS' COLLEGES BE ADAPTED TO NEW NEEDS FOR TRAINING OR SHOULD ENTIRELY NEW INSTITUTIONS BE BUILT?

5.36 IS THE GOAL OF LEARNING THE TRANSMISSION OF KNOWLEDGE? INDIVIDUAL SELF-FULFILLMENT? AIDING THE ACHIEVEMENT OF SOCIAL ENDS? ALL OF THESE? SOME OF THESE? WHICH? WHAT PRIORITIES ARE THERE?

5

5.37 IF EDUCATION IS CONDUCTED BY A WIDE VARIETY OF INSTITUTIONS NOT DIRECTLY CONTROLLED BY PROFESSIONAL EDUCATORS, HOW CAN THE RESULTS BE MONITORED, MEASURED, EVALUATED, AND CHANGED?

5.38 SHOULD STUDENTS AND FACULTY PARTICIPATE IN ADMINISTRATIVE OR OTHER DECISIONS AFFECTING THE PRACTICE OF EDUCATION? AT WHAT EDUCATIONAL LEVELS?

5.39 CAN THE QUALITY OF EDUCATION BE MAINTAINED IF STUDENTS AND MEMBERS OF THE LOCAL COMMUNITY PARTICIPATE IN THE ADMINISTRATION OF EDUCATIONAL FACILITIES?

5.40 HOW CAN THE GLARING INCONSISTENCY BETWEEN THE BUREAUCRATIC NATURE OF CURRENT EDUCATIONAL INSTITUTIONS AND BEHAVIORAL CONCEPTS OF INDIVIDUAL FULFILLMENT, GROUP DYNAMICS, PARTICIPANT DEMOCRACY, AND INDIVIDUAL LEARNING BE RESOLVED?

5.41 HOW CAN NEW ADVANCES IN EDUCATION BE SOLD TO THE PUBLIC WHICH DOES NOT UNDERSTAND THEM? HOW WILL THIS AFFECT EDUCATIONAL FINANCING?

6

6.29 SHOULD CURRICULA BE BUILT AROUND SOCIAL ISSUES AND PROBLEMS OR AROUND TRADITIONAL DISCIPLINES AND SPECIALISTS? SHOULD THIS ISSUE BE APPROACHED IN TERMS OF LEVEL OF EDUCATION?

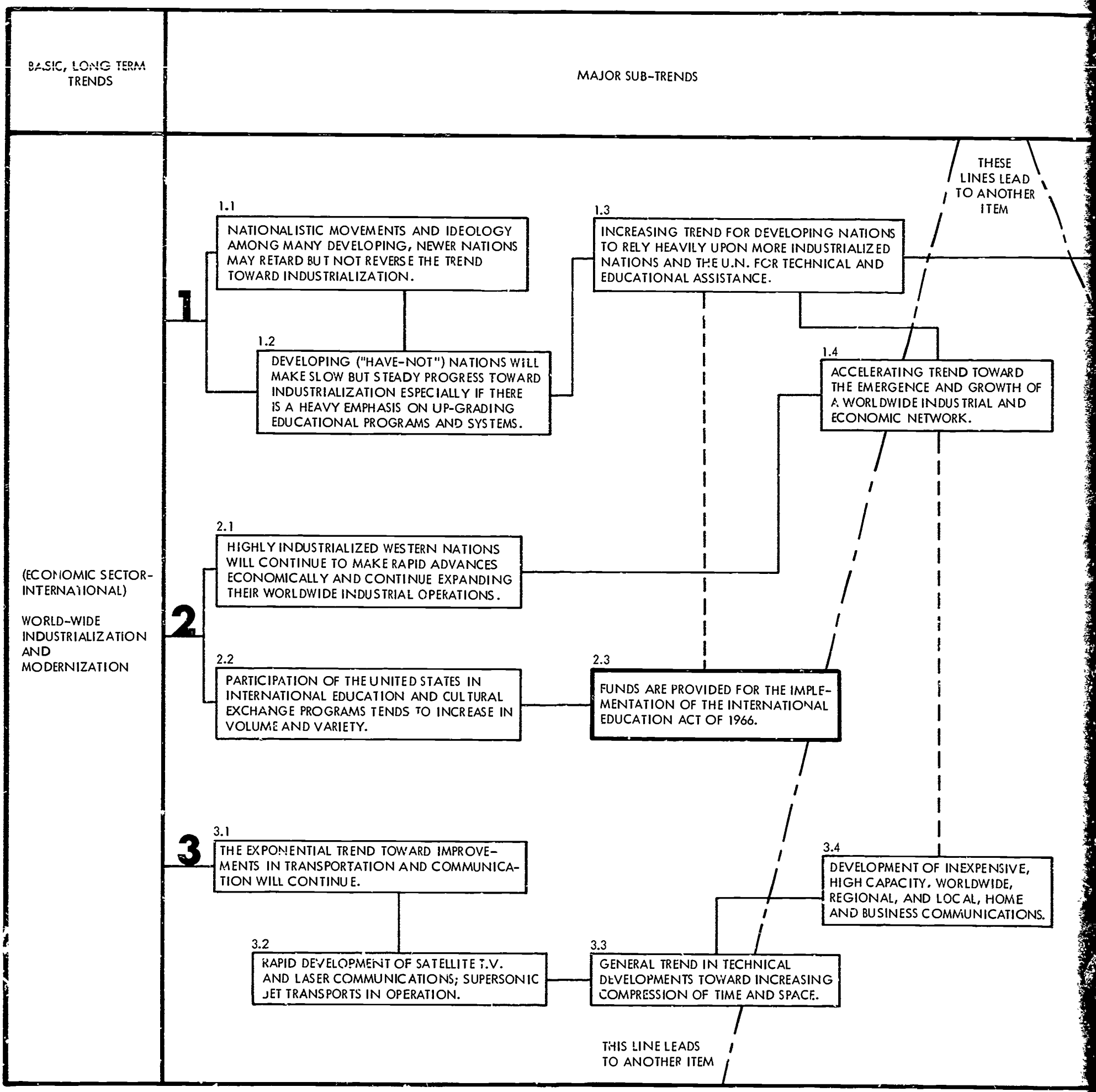
6.30 SHOULD ACADEMIC INSTITUTIONS BE DESIGNED AS ISOLATED INTELLECTUAL COMMUNITIES OR AS INTEGRATED ELEMENTS OF LOCAL COMMUNITIES?

6.31 HOW CAN EDUCATIONAL PLANNERS COPE WITH SUCH PHENOMENA AS INCREASING LEISURE-TIME AND THE 'CULTURAL EXPLOSION?" IS THIS A RESPONSIBILITY OF PUBLIC EDUCATION?

6.32 SHOULD THE EXPANSION OF EDUCATIONAL CAPABILITY BE VIEWED AS A NEED FOR MORE STAFF, IMPROVED USE OF TECHNOLOGY, OR BOTH? IF BOTH, IN WHAT MIX?

FIGURE 2. (Continued)

EXTRAPOLATED CONSEQUENCES OF BASIC, LONG-TERM TREND
GLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE
(SOCIO-CULTURAL SECTOR)



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EXTRAPOLATED CONSEQUEN
WORLD-WIDE INDUSTRIALI
(ECONOMIC SEC

SOCIAL AND TECHNICAL
IMPLICATIONS

THIS LINE LEADS
TO ANOTHER ITEM

1

1.5
TREND TOWARD PROGRAMS FOR INTERNATIONAL AND REGIONAL COOPERATION IN ECONOMICS, E.G., THE COMMON MARKET, AND IN- EDUCATIONAL PROGRAMS.

1.6
TREND TOWARD MORE CLOSELY INTERMESHED INTERNATIONAL ORGANIZATIONS, AGENCIES, ETC.

1.8
DEVELOPMENT OF A WOR D-WIDE YOUTH MOVEMENT EVOLVING OUT OF THE PEACE CORPS, UNESCO PROGRAMS, ETC., TO ASSIST DEVELOPING, HAVE-NOT NATIONS.

1.7
WORLD-WIDE CULTURAL EXCHANGES AND PERSONAL INTERACTIONS BECOMES INCREASINGLY COMMONPLACE.

2

2.4
GRADUAL DECLINE OF THE "NATION" AS THE ORGANIZING UNIT TO BE REPLACED BY REGIONAL COMPACTS, COMMON MARKETS, FUNCTIONAL ASSOCIATIONS, PROFESSIONAL GROUPS AND ORGANIZATIONS, INTERNATIONAL INDUSTRIAL ENTERPRISES, ETC.

2.5
THE CONCEPT OF THE NATION-STATE AS ONE'S ONLY OR PRIMARY CENTER OF IDENTIFICATION WILL GRADUALLY DECLINE IN SIGNIFICANCE.

3.6
THE USE OF MASS MEDIA TO FACILITATE LARGE-GROUP INTERACTIONS AND FEEDBACK ON VITAL PUBLIC ISSUES WILL INCREASE

3

3.5
REVOLUTIONARY DEVELOPMENTS IN TRANSPORTATION AND/OR COMMUNICATION MAY REVERSE THE TREND TOWARD URBANIZATION, ACCELERATE THE TREND TO SUBURBAN LIVING, AND MAKE POSSIBLE AND LIKELY STILL WIDER DISTRIBUTIONS OF POPULATIONS.

3.7
SIBURBIA

FIGURE 3.

QUENCES OF BASIC, LONG-TERM TREND:
STRIALIZATION AND MODERNIZATION
IC SECTOR-INTERNATIONAL)

BASIC, LONG-TERM TRENDS

IMPLICATIONS FOR EDUCATION

(ECONOMIC SECTOR-INTERNATIONAL)

WORLD-WIDE INDUSTRIALIZATION AND MODERNIZATION

1

1.10 GROWTH OF INTERNATIONAL EDUCATION IN MANY FORMS: INSTITUTES FOR THE STUDY OF FOREIGN CULTURES; COMPARATIVE SOCIOLOGY: CULTURAL ANTHROPOLOGY; LINGUISTICS; ETC.

1.13 THERE WILL BE MASSIVE EFFORTS TO ACHIEVE WORLD-WIDE LITERACY.

1.9 THERE WILL BE AN INCREASING TENDENCY FOR STUDENTS AND EDUCATORS TO INTERSPERSE PERIODS OF STUDY, WORK, TEACHING, AND RESEARCH.

1.12 THERE WILL BE INCREASING INTERACTION (STUDENT AND TEACHER EXCHANGE) AND COORDINATION (PROGRAMS AND CURRICULA) AMONG EDUCATIONAL INSTITUTIONS AND SCHOOL SYSTEMS

1.11 INCREASED USE OF NON-FORMALIZED GROUP ENCOUNTERS FOR VARIOUS EDUCATIONAL PURPOSES, BROADENING OF HORIZONS, POLITICAL INVOLVEMENT, "FREE" SEMINARS, ETC.

2

2.6 AN INCREASING EDUCATIONAL EMPHASIS ON A UNITARY WORLD VIEW; RELATIVITY OF VALUES; ONE-WORLDISM; INTERNATIONALISM.

3.10 THE POSSIBLE EMERGENCE AND PROLIFERATION OF THE "DISTRIBUTED" UNIVERSITY IN VARIOUS FORMS.

3.9 EDUCATIONAL PLANTS AND FACILITIES WILL BE MUCH MORE GEOGRAPHICALLY DISTRIBUTED.

3

3.8 THERE WILL BE AN INCREASING USE OF TRANSPORTATION AND COMMUNICATION MEDIA WHICH WILL MAKE EDUCATION LESS DEPENDENT UPON A PHYSICAL LOCATION.

FIG

EXTRAPOLATED CONSEQ
WORLD-WIDE INDUST
(ECONOMIC

EDUCATIONAL FUNCTIONS

1.15
ADMINISTRATION AND MANAGEMENT OF INDIVIDUAL LEARNING DEVELOPMENT TO ALLOW FOR AND TO ENCOURAGE "DROP-OUT" AND "DROP-IN" FLEXIBILITY.

1.16
MATCHING EDUCATED AND TRAINED PERSONS AS THEY PROCEED THROUGH LEARNING PROGRAMS TO EMPLOYMENT OR UNPAID TASK OPPORTUNITIES. INDIVIDUAL COUNSELING AIDED BY COMPUTERS.

1.14
DEVELOPMENT OF WORLD-WIDE, NATIONAL, REGIONAL, COMPREHENSIVE AND LONG-RANGE PLANS FOR LEARNING PROCESSES AND PROCEDURES WITH APPROPRIATE ORGANIZATION. THE PLANNING FUNCTION BECOMES INCREASINGLY COMPLEX AND DIFFICULT.

2.7
ORGANIZATION AND CONDUCT OF SEMINARS AND CONFERENCES ON SUBJECTS OF WORLD INTEREST WITH WORLDWIDE PARTICIPATION.

2.9
DEVELOPMENT OF CAPABILITIES FOR SIMULTANEOUS LEARNING BY MULTILINGUAL PARTICIPANTS IN A LEARNING SITUATION OR PROCESS.

2.8
DEVELOPMENT OF A CURRICULA APPROPRIATE FOR A UNITARY WORLD-VIEW: ONE-WORLDISM; INTERNATIONALISM.

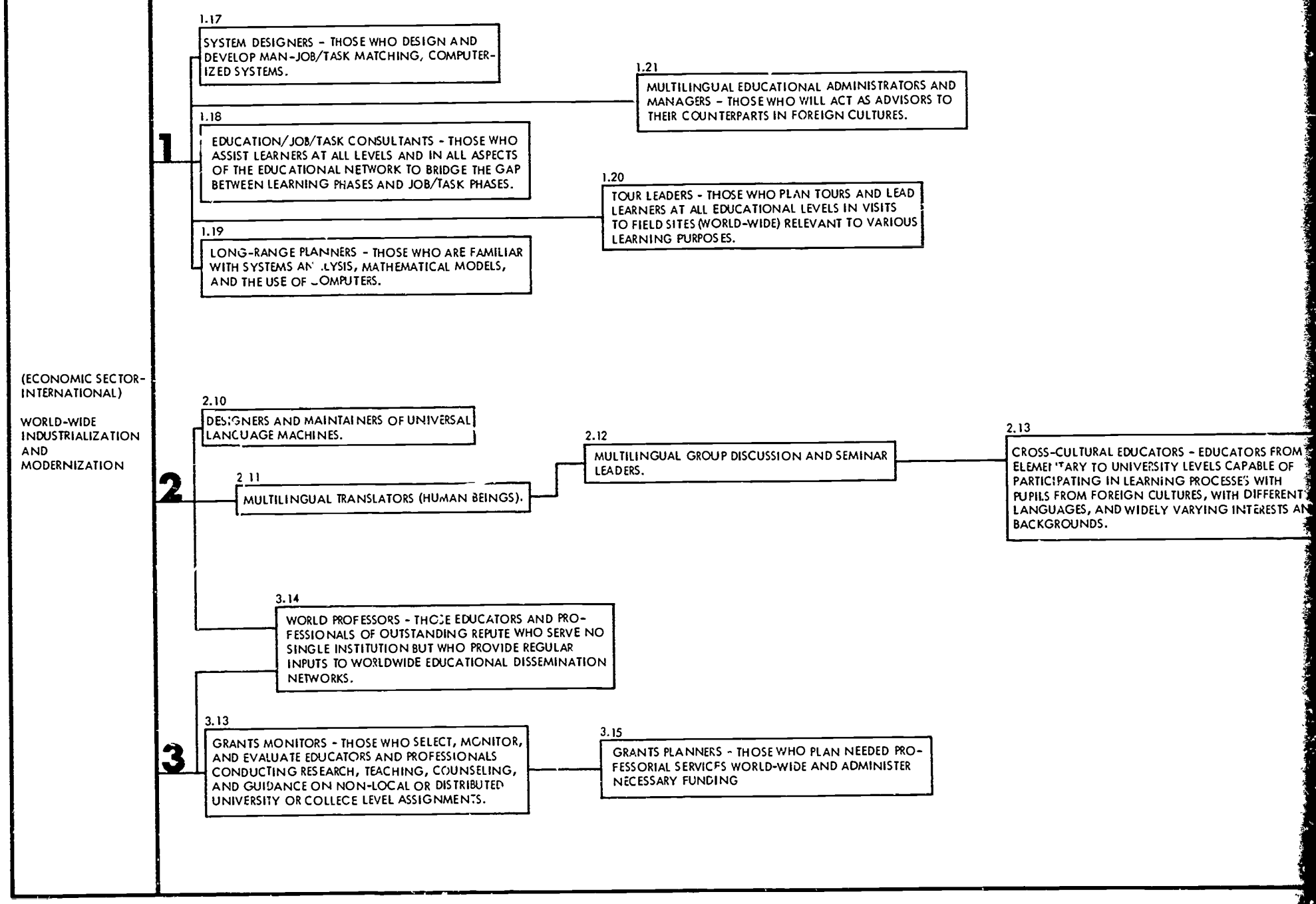
3.11
DESIGNING AND DEVELOPING THE ADMINISTRATION, OPERATIONS, AND CURRICULA FOR DISTRIBUTED UNIVERSITIES AND DISTRIBUTED LEARNING AT OTHER EDUCATIONAL LEVELS.

3.12
ADMINISTRATION, OPERATIONS, AND CONDUCT OF LEARNING PROCEDURES IN DISTRIBUTED ENVIRONMENTS.

FIGURE 3. (Continued)

ONSEQUENCES OF BASIC, LONG-TERM TREND:
NDUSTRIALIZATION AND MODERNIZATION
NOMIC SECTOR–INTERNATIONAL)

BASIC, LONG-TERM TRENDS	POSSIBLE FUTURE ROLES



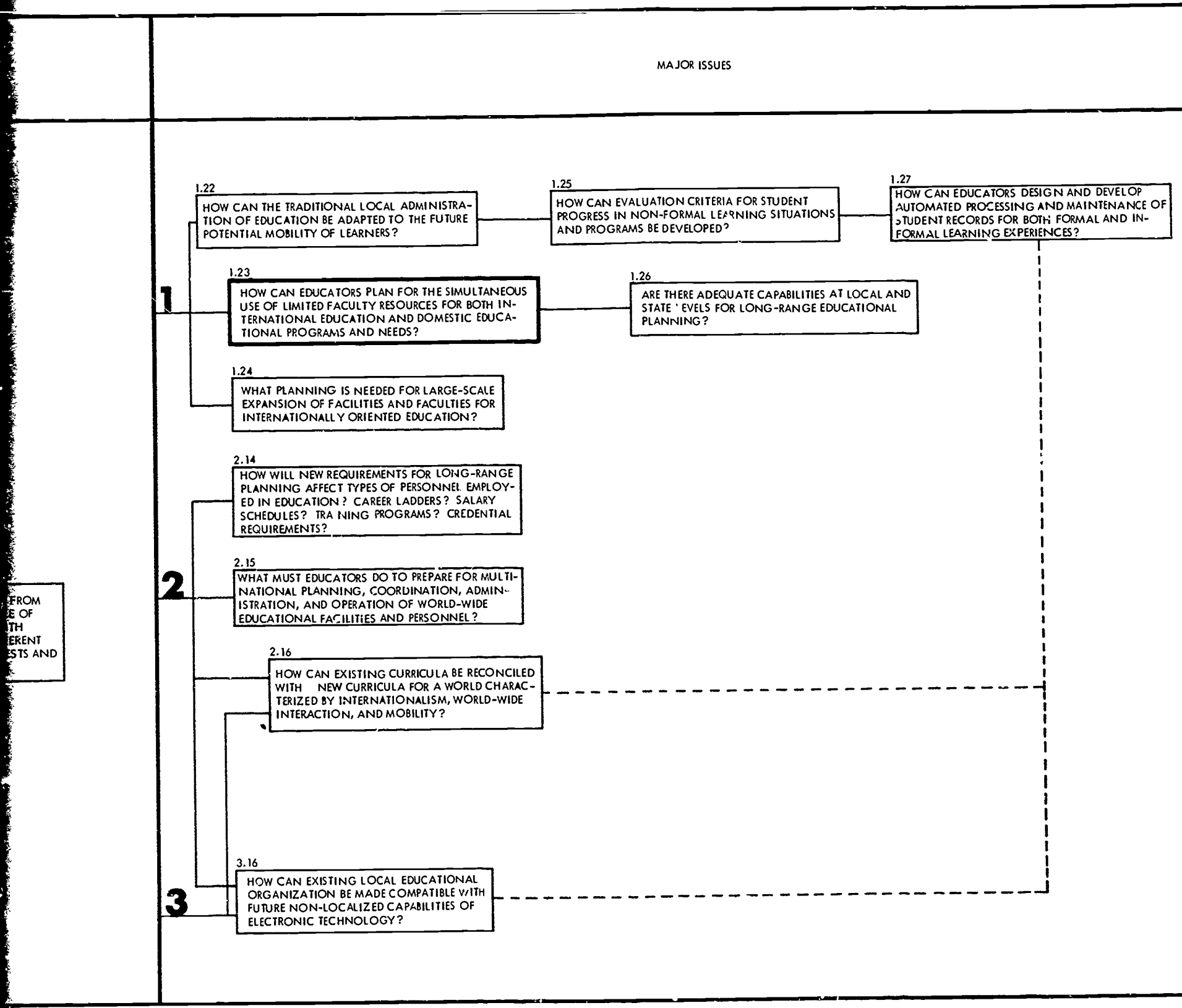


FIGURE 3. (Continued)

TRAPOLATED CONSEQUENCES OF BASIC, LONG-TERM TREND:
WORLD-WIDE INDUSTRIALIZATION AND MODERNIZATION
(ECONOMIC SECTOR-INTERNATIONAL)

This description of the structure of the contextual map is presented here to illustrate a general approach to conjecturing about the future for specific purposes and in a systematic fashion. The structure described in the narrative and portrayed in the figures should be recognized for what it is: an experiment in the development of a method for conjecturing about the future which would be useful in a public forum or educational politeum. It is assumed that these preliminary efforts will undergo frequent revision as we gain experience in using the method.

B. Map Content

1. Application of a Method String

The structure of the contextual map and its content are closely related. The one suggests the other, as we noted in the previous section. The extensive body of literature dealing with social and technical trends suggested the need for a systematic method, such as a contextual map, for dealing with them; and at the same time, these literature sources provide, in part, the content of the map cells. It would have been possible, of course, to generate our own time-series extrapolations and analyses of social and technical trends. But much work had already been done in these areas by others. The more practical and useful course of action was clearly to make maximum use of the extensive published material.

In the SDC progress report cited earlier, it was pointed out that "the value of a method may be altered when it is examined, not by itself, but as one step in a logically sequenced combination or string of methods." The concept of a "method string" implies that one method or a number of methods may provide inputs to the operation of another method, such as contextual mapping, (or as time-series extrapolations and macrohistory are used at the Hudson Institute to develop scenarios) while additional methods may make use of the outputs or results of all the previous methods employed.

The content of the contextual map described in this report is based on an application of a method string. As we noted in describing the rows of the matrix in Figure 1, the "basic, long-term trends" were derived from the work of the Hudson Institute. The content of the intervening variables in the "Major Sub-Trends" column in Figure 1, were also derived in part from the publications of the Hudson Institute, the publications of the Commission on the Year 2000, and many other published sources which have used a variety of methods to identify major trends. These sources are listed in the bibliography of our previous progress report.

Other methods may be used in conjunction with the contextual map either to provide supporting data or to make use of outputs of the mapping process. To illustrate, we may assume that a user of the map desires a closer examination of a particular entry in a cell. A computer model containing appropriate variables might be operated to provide requested outputs, such as annual projections of student or teacher populations. If educational objectives can be formulated through study of the contextual map, after consideration of possible alternatives, a relevance tree might be constructed to determine systematically the types of educational programs, their costs, personnel requirements, and curricula changes, etc., which would be needed to accomplish the objectives.

All the possible combinations of method strings cannot and need not be formulated at this time. There is no limit to the range of possibilities. To explore this range will require a great deal of additional work on specific substantive problems. This should be a task of the operational centers. What is evident now, however, is that the contextual map lends itself to the combined use of a variety of other useful methods.

2. Logical and Causal Dependencies

At the extreme left of Figures 2 and 3, then, are the independent variables--the basic, long-term trends of Western civilization. Proceeding to the right we derive the intervening variables--major sub-trends. Up to this point we are dealing with either historical "facts" or trends which can be supported by data such as time-series extrapolations. As we proceed further to the right, we leave the realms of history and data behind and enter the realm of conjecture based largely on extrapolations of social, cultural, and technical trends and associated theoretical analyses. We begin to identify causal dependencies of the basic trends and sub-trends; to make logical deductions; and to infer implications. Thus the vertical axis divides relatively accepted "knowledge" toward the left and more unreliable ideas about trends to the right. We also identify alternative possible directions of trends or sequences of developments. For example, urbanization may increase or it may decrease; the polarization of society on the basis of race and educational level may increase or decrease; centralization of power in organizations may increase or decrease; etc. The long-range implication of the mapping process is that each alternative should be explored for its consequences.

No distinction has been made in Figures 2 and 3 between the content of entries which have been taken directly from published sources and those which have been derived by SDC personnel by logical and causal analysis of the major sub-trends. No claim is made that the content of the entries and the logical and causal relationships which we have shown in Figures 2 and 3 are the only possible ones or that the content shown is exhaustive. Clearly, if others had developed the map content, different entries might have been regarded as more important, the entries might have been worded in other ways, and different logical and causal dependencies might have been preferred. No argument is offered to prove or to verify that the content sequences portrayed are "true" since there are no facts about the future which can be proven or verified. They do portray reasonable and responsible conjectures about the future.

3. Time-independent and Time-dependent Features

Conjecturing about the future using a contextual map differs from time-series extrapolations in an important respect. Time-series extrapolations, as the name implies, are attempts to forecast the events which will occur or the conditions which will exist at specified time intervals. Contextual mapping, by contrast, is less constrained by a requirement for precision with respect to timing. The reason for this is that the purpose of the contextual map is to reveal logical or causal dependencies among functionally related sets of phenomena; thus trend relationships are explored without the necessary requirement to state precisely when a dependent set of events or conditions may occur or what their time spans are. This does not mean that a general time frame is not provided if it is at all possible to do so. The difference is one of precision in specifying the time spans or time intervals. While we make no attempt, therefore, at precise pinpointing of events depicted in the contextual map described herein, we do assume that the time span encompassed by the map to accomplish the purpose of deriving concepts of roles for educators is approximately twenty years. It is apparent, however, that some of the trends displayed cover periods longer than twenty years.

However, where there are questions or debatable issues over specific trends or other conjectures about the future for specific

time intervals, it should be possible for time-dependent methods, such as time-series extrapolations, to be requested where such data may be available in the operational center's data banks, for example, anticipated rate of growth of urban centers.

III. ADVANTAGES OF CONTEXTUAL MAPPING FOR EDUCATIONAL POLICY MAKING

A. A Systems-Oriented Display

The special virtue of the display of horizontal rows of basic types of phenomena--cultural, economic, science and technology, etc.--is that this type of presentation brings out systemic relationships that are too frequently overlooked in typical research reports, books, and monographs. Thus the contextual map is a true "systems-oriented" approach to the problem of educational policy formulation and educational functions/roles design for the future. The logical and cause-effect dependencies as revealed along the time dimension from left to right and the intersector dependencies extending both upward and downward serve to force out into the open inconsistencies, contradictions, alternative possible trends and directions, critical issues, unresolved or previously unnoticed problems, potential conflicts, and interrelated events which are more typically treated independently.

The framework for conjecturing about the future provided by the headings of the columns and rows of the contextual map as shown in Figure 1 were selected specifically to meet the methodological and substantive objectives of the SDC project. These objectives were necessarily constrained by limited resources and time. However, from the point of view of long-range development of contextual mapping as a method for conjecturing about the future, the scope and contents of the map should be enlarged so that the conceptual framework would include many other aspects of education in additional columns not now shown in Figure 1 and many other features of social phenomena in additional rows. Ideally, the scope and contents should be as complete as possible since one cannot know a priori which cultural, social, and technical trends and which logical and causal consequences will have the most significant implications for education. To illustrate this point, additional aspects of education which might be represented by columns might include: Educational Organization, Educational Finance, and Educational Legislation, etc. Additional features of the social realm which might be represented by rows might include other basic, long-term trends identified by the Hudson Institute: Population Growth, Urbanization and the Growth of Megalopolises, Much Turmoil in New and Industrializing Nations, etc. Furthermore, the contextual map described in this report is based on such assumptions as a "surprise free world" and "the absence of stark life and death issues." Alternative contextual map frameworks should be developed reflecting more pessimistic assumptions.

B. Support for the Determination of Wants

The type of trend extrapolation represented by contextual mapping, as Erich Jantsch has pointed out, lends itself to considerations of what policy makers want the future to be. The map reveals a wide range of potentialities, alternatives, and possibilities. Critical events or trends are identified as such and attention is called to them by flagging devices. The extreme right-hand column of the map contains many issues with which policy makers should be concerned. Policy makers may employ the issues and problems identified in the map as the bases for debate and decision resolution. From this point of view, it becomes increasingly apparent that the purpose of trend extrapolation, as exemplified by contextual mapping, is not to make forecasts, as we pointed out in our previous report, but to map out alternative courses of action from among which policy makers may make responsible choices and thereby attempt to gain some degree of control over the general course of events.

C. Contribution to Public Debate

In the SDC progress report cited earlier, it was pointed out that a desirable function, if not an absolute requirement, of an operational center devoted to future-oriented educational policy research was a capability for public discussion and debate on vital issues. The contextual map method has been pursued and developed as a logical consequence of that concept. There are three aspects to the requirement for public debate: (1) the need to make social and technical trend analyses public rather than private through graphic display of the trends as such, and to facilitate open discussion of the analyst's theories, assumptions, and biases; (2) the need to provide a more readily usable procedure or technique for the familiarization of busy policy makers (suffering from information overload) with developing trends; and (3) the need to provide a forum in which individuals and organizations with different interests and points of view, representing all sectors and levels of the community, can express their wants for the future of education and debate the issues involved.

1. Public Character of Trend Analyses

In the course of our survey of forecasting methods a number of conclusions quickly emerged. The art of conjecturing about the future has been extensively applied in the area of technology while almost nothing has been done in the social realm. Although social scientists write and talk at great length about trends, there is no commonly accepted methodology to social trend extrapolation. The procedure for deriving trends is private in nature. It is frequently impossible to tell how a social analyst

derived his trends or if his method could be replicated by another scientist. In many cases the analyst provides no data or evidence to support his alleged trends, nor does he always make explicit his theories, assumptions, and biases. Since, for the most part, an analyst's trends are presented in publications of various kinds, the reader is unable to challenge the analyst's views or to determine whether his notion of the future is based on a method, on evidence, or whether he is merely expressing an opinion or intuition.

The value of contextual mapping is that the structure of the matrix, the identification of the cells, and the nature and sequences of the entries in each cell require those who make the map in the first instance, and those who observe and use it, to make explicit in a public context the nature of their theories, explanatory hypotheses, sources of data, if any, and their underlying assumptions and biases.

2. Familiarization of Policy Makers with Trends

There is no need to belabor the obvious point that busy policy makers have a problem in keeping abreast of the flood of published literature dealing with conjectures about the future. Policy makers today, no less than managers in industry and scientists, suffer from information overload. Policy makers can afford to ignore the potential problems of the future only because they can barely keep up with the problems of today. The solution, we believe, must lie in the development of a technique and procedures whereby information about trends can be presented to the policy maker in a form so that the trends themselves can be readily understood and their implications and consequences quickly grasped. Furthermore, this technique and procedure must not be private in character. Because of the complex nature of trend projections, the vagaries of social science theory, and the problem of bias, the capability to publicly discuss the trends and their implications is essential. The policy maker must be able to query the analyst for more information, to challenge his theories, and to force him to make explicit his biases.

3. A Public Forum for Debate on Policy Issues

The determination of policy making in education is a distributed function. The course of education in the United States is charted by the federal government, state departments of education, local school boards, and now increasingly by various associations, labor unions, community organizations, and by the students themselves. One thing is certain, an operational center, under these

circumstances, must not be an island of research. Any future operational center must provide a forum in which individuals and organizations with different interests and points of view, representing all sectors and levels of the total community, can express their wants for the future of education and debate the issues involved. To accomplish this goal, common frames of reference must be established, ideas about social trends must be shared as a basis for debate, evidence or data must be made available to support an argument upon request, or it must be made clear that no evidence or data are available to be brought to bear on the subject at hand. Our study of wants by T. B. Robertson (see Appendix D) has made it abundantly clear that without such a capability, an operational center could only contribute to the glut of literature which already is overwhelming the field of education and would fail to resolve the wants dilemma.

4. Progressive Expansion of the Contextual Map

We have already described the basic construction and use of the contextual map. This, as we have noted, lends itself to public review of trend concepts and their possible consequences. One further point needs to be made about the mapping approach from the point of view of technique and procedures to satisfy the needs of various kinds of users. There are no insurmountable methodological or technical obstacles, given adequate resources, to proceed further and, for the purpose of closer examination by a variety of publics, to create a large number of contextual maps composed of different structure and content, to enlarge each cell of the matrix of a selected map, or to enlarge any particular entry of any cell, and display their elements on a scale equal to the original map (see Figure 4). The map and substantive data displayed would depend upon the interests of a particular audience: the futurists developing their hypotheses about trends; the policy makers querying the futurists; policy makers debating with each other; and policy makers clarifying their positions on issues with community representatives. This type of procedure represents a potential capability to add a third dimension to the mapping method--a capability, in effect, to move into a map, a cell, or an entry in depth, in much finer grained detail, for investigations of special interest.

The display of a complete contextual map or maps and the progressive expansion of map cells and entries indicated in Figure 4 could be accomplished by the use of a system of several random access slide projectors. Such a system would be relatively inexpensive, not exceeding several thousand dollars, and would partially satisfy the requirements for a public display capability.

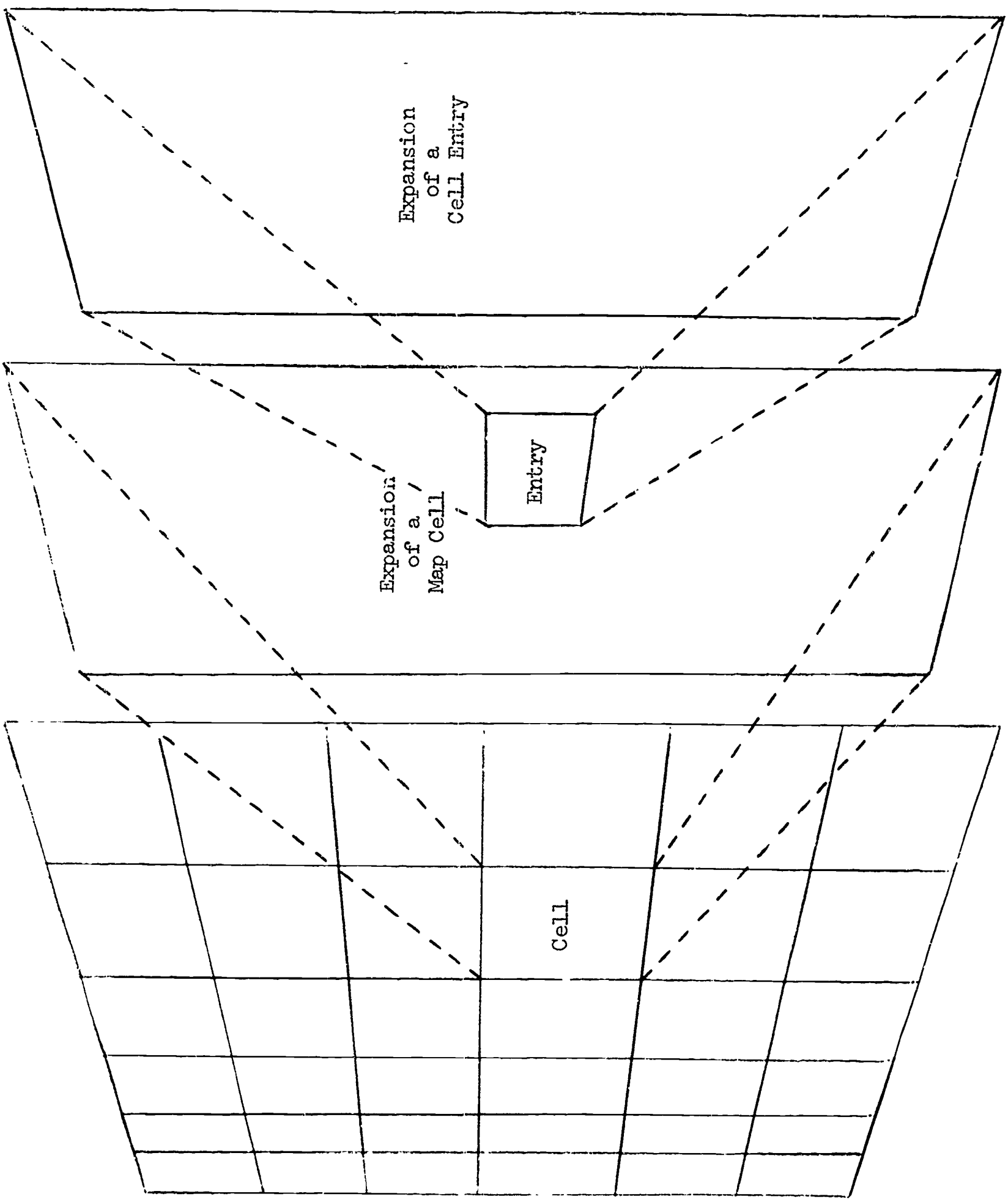


FIGURE 4. PROGRESSIVE EXPANSION OF A MAP CELL AND ENTRY

D. Support for Interdisciplinary Team Operations

The value of using work teams composed of specialists trained in a variety of disciplines is well established as a method for coping with complex social and technical problems. However, physical aids to facilitate the process of interaction which is basic to interdisciplinary team operations are not highly developed. In actual practice, the team too frequently differs little in its procedures from committee meetings or seminars. At its worst, interdisciplinary team members conduct their work in relative isolation and only on rare occasions interact with their colleagues. Typically this might take the form of an exchange of working papers for review and criticism.

It is suggested that the use of a contextual map possesses an inherent capability to enhance considerably the interaction process of interdisciplinary team members. There are a number of reasons for this. First, the map would provide all members of the team with a common frame of reference. The lack of a common view of the problem and its component elements is, perhaps, one of the major obstacles facing the team during the early phase of work. Typically it may require months of hard effort merely to establish a concept of the issues at hand and a common conceptual framework and language with which to begin operation.

The explicit substantive data composing the contextual map forces into the open the implicit assumptions, the working concepts, and the theoretical presuppositions held by the team members by virtue of their specialized training. Thus, the contextual map serves to overcome some of the disadvantages of "trained incapacity" since each specialist on the team is forced to engage in a working dialogue with his colleagues to defend and justify his biases, assumptions, and theories. The "incapacities" of each member of the team are compensated for by the capacities of the others.

A second advantage of the contextual map, since it is organized by subject areas, is that it provides foci of attention for the various specialists on the interdisciplinary team. Thus, each specialist can begin immediately to concentrate on developing the substantive data in his area of expertise and, since he is an expert, he is able to develop that area more thoroughly than other, less qualified members of the team. This implies, of course, that there should be correspondence between the specialized fields represented by the team and the substantive concerns displayed on the map. Since the substantive data comprising the map are designed by a team of specialists, this provides some degree of assurance that these data are a responsible set of conjectures about the future. By virtue of its multiple and diverse input sources, the map will reflect a degree of balance,

perspective, and the elimination of idiosyncratic bias which could not otherwise be achieved.

The third advantage of the map, as we have noted, is that it indicates interdependencies among subject areas and suggests logical and causal sequences of phenomena. These interdependencies are, of course, hypotheses about the future and they serve to structure the interactions of team members both in terms of subject matter and in terms of the particular specialists with relevant interests. The map, for example, may suggest that demographic trends, information technology, and computerized models may all be relevant to educational issues pertaining to student-teacher ratios, the design of classroom facilities, the possible uses of individualized modes of instruction, and so on. Thus the problems raised by an examination of interrelated phenomena displayed on the contextual map may call for the combined efforts of a demographer, a mathematical modeler, a data processing specialist, an architect, and an educator.

E. Potentialities for Training

In the previous progress report it was suggested that one of the major functions of an operational center should be to provide training for both neophyte futurists and educational policy makers at all levels of the educational establishment. Our recent work in the development of the contextual map has led to the conviction that it lends itself to the training function in a variety of ways. These include the identification and conduct of research problems, simulation, and gaming.

The neophyte educator*, training for the role of educational policy maker, regardless of the educational level of concern, will be required in the years ahead to understand something of the state of the art in conjecturing about the future and the substantive issues and problems in education revealed by that art. Studying and working with a contextual map of the type described in the previous pages would provide an excellent way to engage in such studies. Since the entries on the map and the supporting data bases such as time-series extrapolations, mathematical models, computer programs, etc., deal with hypothesized trends. the neophyte educator must understand the nature of trend statements, the assumptions which underlie them, and the concepts and theoretical explanations from which they are derived. He has the opportunity to question, challenge, and explore the problems associated with the validation and reliability of trend analyses, and the extant theories of psychological and social causation implied by the

*A "neophyte educator"assigned to an operational center as an intern might be a Ph.D. candidate in a School of Education.

arrangements of the map entries. In addition, of course, he may immerse himself in understanding, exploring, and researching the issues and problems associated with the implications of trends for education, such as new functions and roles of educators.

Working in the context of an interdisciplinary team, the neophyte futurist or educator would quickly acquire the "systems orientation" to the investigation and resolution of complex social and technical problems. The range of trends and phenomena displayed on the map as well as its use by individuals from different disciplines demands of the neophyte a capacity for "generalization" as distinct from "specialization" while, at the same time, he is forced to substantiate with hard data any theoretical position he may wish to take. This process occurs in the company of more mature and experienced futurists and educators whose skills and knowledge are imparted to the neophytes in face-to-face encounters with the contextual map as the focal point.

The extreme right hand column of Figure 1 lists the major issues which are logically or causally derived from the implications of the long-range trends and sub-trends. These issues may lend themselves to the formulation of Ph.D. dissertation subjects. But, in addition, the issues displayed may also be made the bases for various types of simulations and gaming exercises of the "what if?" type. For example, if the International Education Act of 1966 is funded in the near future, and we also note that "higher educational institutions will be required to accommodate quadrupled customers by 1980," these two sets of events, which pose the possibility of conflicting uses of scarce faculty resources, may form the bases either to simulate what an individual educational policy maker might do under such circumstances, or to establish a game in which members of the center team play such roles as administrators of the International Education Act, university presidents, officials of the U.S. Office of Education, and the Ministers of Education of developing countries. The purpose of the game could be either educational, in that each team member would be forced to become more familiar with the details of the issue, or it could be designed to seek out an actual solution to the problem.

F. Credentialing of Futurists

We have stated that the design and use of the contextual map will force those who conjecture about the future to make explicit the methods, concepts, and theoretical presuppositions whereby they derive their ideas. It may eventually become possible, therefore, by judicious record keeping of what these individuals do, as well as by recording the interactive processes described in the previous sections, to begin to formulate the criteria which distinguish a competent

futurist. In addition, the day by day conduct of these individual and group processes may make evident what types of training and experience contribute to the development of the skills of the competent futurist. Thus an eventual outcome of the use of contextual mapping over an extended period of time could be the formulation of the credentials necessary to separate the professional futurist from the prognosticator, the forecaster, the seer, and the prophet. This is not to demean the roles played by uncredentialed futurists--it is merely to point out that these two types of roles are different and serve different purposes. It would be useful, therefore, through the establishment of formal credentialing criteria and procedures to make these distinctions clear.

Permanent records in the form of photographs could be kept of all map entries on a daily, weekly, or monthly basis, depending upon the frequency with which the entries are changed. Thus the operational center would be able to maintain a permanent record of its own conjectures about the future. At regular intervals, actual trends could be compared with previously conjectured trends and the reasons for deviations, where they exist, could be systematically investigated by the center team. By this means successful methods for trend analyses could be gradually separated from those which tend to be unsuccessful. Such a process would obviously contribute to the methodology of studying the future and also contribute to the development of criteria for the credentialing of futurists.

MATHEMATICAL MODELS FOR EDUCATIONAL PLANNING

by

Zivia S. Wurtele

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I. INTRODUCTION

The utilization of computer programmed mathematical models for educational planning has a brief but rapidly accelerating history. This paper is a survey of such models. The proliferation of models, as well as their increased complexity, has received impetus from a growing reliance on the part of the Western world on planning. Models are a crucial tool for analyzing the complex interdependencies among the vast number of variables of societal systems since the information to be handled exceeds the capacity of a human brain.

During the past five years, many countries have begun to experiment with educational planning models. Western countries for which such models have been implemented on a national scale, in addition to the U.S., include Great Britain, the Netherlands, France, Norway, Sweden, Australia, Spain, Turkey, and Greece. Two international organizations have encouraged a systems-analytic approach to educational planning: the Organization for Economic Cooperation and Development (OECD) and the United Nations Educational Scientific and Cultural Organization (UNESCO). An International Institute for Educational Planning has recently been established by the latter. It is the purpose of this survey to describe, and to some extent evaluate, some of the models which have been developed. This survey is in no sense complete; however, it is hoped that the models considered here are representative of the spectrum of educational planning models that are currently being implemented. The most serious gap is probably the omission of planning models of the Soviet Union and Soviet satellite countries, for these countries, with their longer history in planning, are more experienced in the use of adaptive controls. Though the survey is not comprehensive, it is hoped that it covers the major types of models that have been utilized. This paper is directed primarily to the reader who is knowledgeable in the field of mathematical models, but who is not familiar with applications of these techniques to educational planning.

Models may be classified, according to subject rather than according to structure, as follows:

- Models which represent the educational system or some of its components.
- Models of the economy in which education is one of the components.
- Models of the technology of the educational process.

Models in the first category which have aroused considerable interest in recent years are demographic models for projecting student or teacher populations. Many of the models that have been recently implemented for this purpose are based upon transition proportions* and have the same general structure.

* See Section II-A.

Large-scale computerized models of this form were developed by the U.S. Office of Education and by the British Department of Education and Science [2,20]. This category includes other demographic models based upon trend extrapolations; extensions of demographic models in which physical requirements (teachers, capital goods, materials) are projected on the basis of projections of student enrollments; and cost-benefit models. Also included are models of individual school activities which project student enrollments in alternative course sequences and the consequent utilizations of teachers' time, equipment, and so forth. SDC formulated a model of this type and applied it with considerable success to several schools (see Cogswell [6]).

Models of the second type are considerably more difficult to develop, for not only the structure of the educational system must be represented, but in addition, structures of other sectors of the economy as well as the interfaces among these sectors. Work along these lines relies upon a theoretical basis provided by the economist, T. Schultz [27,28,29]. The educational sector is viewed as a producing sector with inputs (e.g., teachers, buildings, books) and certain outputs. One of the first questions to be resolved is how to measure educational outputs; probably the simplest definition, in terms of available statistics, is the numbers of students at different educational levels.

The third category includes learning models and, more generally, stochastic models of individual behavior that represent processes of becoming educated. Models in this category are beyond the scope of this paper for they are tools for educational or scientific research rather than for educational planning.

II. MODELS OF THE EDUCATIONAL SYSTEM OR OF ITS COMPONENTS

A. Demographic Models Based Upon Transition Proportions (Macro-Models)

One of the initial questions facing educational planners relates to the size of future student enrollments at different levels of the educational system. In recent years, models for solving this problem have been implemented in several different countries. Many of these models have essentially the same structure; they are Markov-type flow models based upon transition proportions. Applications of this type of model will be discussed in this section, and to avoid duplication, the references to individual examples will be preceded by a description of a prototype of this model and by some general considerations related to this type of model.*

The population of the region for which the model is to be implemented is divided into mutually exclusive categories. These categories will include levels of the educational system under investigation as well as sectors

* See Attachment for a mathematical formulation of this model.

outside of this system; for example, preschool, first through sixth grade, junior high school, high school, junior college, college, graduate school, outside school. The parameters of the model are transition proportions. A transition proportion between two categories is the proportion of the people in the first category at time t who will be in the second category at time t + 1. Time units may be semesters, single years, three-year periods, etc. If the distribution of the population among the categories is known for an initial time period, and if in addition, new entries to the system (births and migrants) are given, then the transition proportions may be employed to predict the population distribution in the succeeding period. Furthermore, if new entries and transition proportions are given for a sequence of time periods, then the populations in each of the categories for each of the time periods may be predicted by repeated applications of this procedure.

In initial implementations of this model, it is not uncommon to assume that the transition proportions do not change during the time span of the forecast. In examining the implications of this assumption, one may distinguish between two sources of change in these proportions. The first is due to changes in behavioristic patterns of people, whereas the second is due to changes in the mix of population characteristics within individual categories due to births, deaths, and movements in and out of the region. Little can be done toward mitigating the effects of the first of these sources of change; the assumption of fixed proportions is reasonable if change is slow during the time span under consideration. Some of the difficulties associated with the latter type of change may, however, be avoided by treating explicitly those population characteristics which are strongly associated with the transition proportions. One such characteristic is age; the incorporation into the model of age-specific transition proportions, by increasing the number of levels so that each level is restricted to one age year, will eliminate changes in transition proportions due to changes in the age distributions within categories. Similarly, increased precision may be expected from a stratification of the population on the basis of sex and of relevant socioeconomic or ethnic characteristics and the use of different transition proportions for each stratum. An important advantage of assuming fixed transition proportions derives from the mathematical form of the resulting model; it is a system of simultaneous difference equations with fixed coefficients with mathematical properties that are known for different assumptions about the new entries.

As described thus far, the transition proportions reflect actual flows between levels. If capacities are restricted, the model may be modified to take this into account by including rules for rerouting flows so as to avoid exceeding capacities, and by reinterpreting the transition proportions in terms of demands for flows. Unfortunately, past data on actual flows under conditions of capacity restrictions cannot be used

as estimates of demands for flows since such ratios depend also upon institutional admission policies. This problem is discussed by Armitage and Smith [2].

This type of model is also used for estimating the numbers of teachers in different levels of the educational system, but there are differences to be noted. Transition proportions are less stable than in the case of students, for they depend less upon institutional or cultural factors and more upon the economic environment; this is true both for flows to and from non-educational sectors.

Given the number of students at the different educational levels, the calculation of the physical inputs associated with these levels (numbers of teachers, numbers and sizes of buildings, material, etc.) depends upon the educational technology assumed; the demand for teachers is determined in this way. The supply of teachers, however, depends upon the number of graduates at the appropriate levels, the number of individuals qualified to teach who are outside the educational system, and the number of teachers from the preceding periods who continue teaching, and may be estimated by means of a model of the type described here.

The ubiquity of this model is evidenced by the following examples:

- A model of this type, DYNAMOD II (U.S. Office of Education [36,37]), has been implemented on a nationwide basis to predict both student and teacher populations. Separate transition matrices are estimated for each of four sex-race groups. About 30 age-educational categories are employed; one category is for deaths. Population data inputs were obtained from the U.S. Bureau of Census' 1/1000 sample data taken from the 1960 Census of Population. Birth projections for the nation were given in absolute numbers and obtained from the U.S. Bureau of the Census Population estimates. In contrast, death rates were utilized in the model and wherever possible, these were adjusted for occupation as well as race and sex. Projections derived from DYNAMOD II do not differ substantially from the Office of Education projections which were published by the U.S. Department of Health, Education, and Welfare in 1965. Since grouped age categories are used in the model, a sudden increase in the population of a single-age year group will tend to be smoothed out over time; this may explain some of the differences between these two sets of projections. The U.S. Office of Education is currently developing a more detailed model STAG, which employs single year age groups.

- A model of the educational system of England and Wales has been developed jointly by the British Department of Education and

Science and the Unit for Economic and Statistical Studies on Higher Education [2,20]. This is a large-scale computer model, probably the first to be developed on so ambitious a scale. Eighty-two activities were considered, e.g., primary school student, first year undergraduate in pure science, primary school teacher, outside world, deaths, and for each of these activities, a range of ages is given. Each category is specified by activity and age. Since movements occur annually, only transitions between categories that represent consecutive ages are possible. However, in spite of the large number of zeros in the matrix of transition proportions for movements between categories, this matrix contains over 10,000 positive entries. The computer program includes an option for systematic updating of the transition proportions, e.g., by trend increments. Transition proportions were estimated from stock data with the base year 1961.

- Stone's model of the educational system [30] is formulated with the ultimate goal of incorporating it into an economic model of Great Britian (see reference [34]). Since one of the purposes of such an incorporation is to relate educational achievement to skills required in the economy, the system modeled includes industrial and professional training as well as formal training in educational institutions. The model contains three sets of parameters: transition proportions for flows from one educational process to another; age-specific birth rates; and age-specific death rates. Time periods are one year. It is recommended that separate transition proportion matrices be employed for different socioeconomic classes. An epidemic-type model for changes in these proportions is introduced in which the change from one year to the next in the proportion of students going from one educational process to a higher one depends upon the proportion that made the transition during the previous year and the proportion that did not make this transition but were academically able to do so. At branching points where several alternative educational programs are available, it is suggested that the future proportion of students that select a given alternative is a weighted average of the proportion for the previous year and the proportion that is consistent with the demands of the economy.

- Two projection models of this general type have been implemented in Sweden on a national scale, a model of compulsory schooling and a model of university faculties which takes explicit account of restricted entries to certain faculties by introducing waiting periods between examination for college entrance and first enrollment in college (see reference [12]).

- The Norwegian Educational System has been modeled along these lines by Thonstad [31] . A distinction is made between school activities (non-absorbing states) and different levels of completed educations (absorbing states); it is assumed that once an individual has left the educational system, he will not return. Death is treated as a separate absorbing state. The educational system is classified into 60 activities of one year's duration; 17 levels of completed education are considered.

- A model of this type was utilized by J. Gani [14] for projecting enrollments and degrees awarded in Australian universities; results obtained were found to fit actual data for a five-year period fairly closely.

B. Demographic Models Based Upon Transition Proportions (Micro-Models)

The models described above are all macro-models; they depend upon the average behavior patterns of groups of individuals. In contrast, it is possible to develop a micro-model in which the individual is the basic unit, along lines described in Orcutt [22] . Rules for movements of individuals between educational levels would be incorporated into the model; such rules specify transition probabilities for an individual based upon relevant factors in the individual's past and his present, such as educational history, socioeconomic class, educational attainments of parents, employment history, age, sex, marital status and other familial characteristics, and so forth.

The future course of a sample of individuals would then be simulated in accordance with these rules, i.e., transitions would be made for each time period in accordance with the transition probabilities by the use of random numbers. This type of model is richer in terms of the kinds of questions it can answer, for results can be aggregated according to the characteristics included in the individual histories. In the macro-model, on the other hand, the classification scheme adopted for the educational system is a constraint on the information obtainable (see Moser [20]). Data requirements for a micro-model of this type are fairly stringent for they involve the establishment of individual data records.

C. Demographic Models Based on Simple Trend Extrapolation

Without attempting any analysis of the structure of the educational system and of the flows within it, student enrollment may be estimated from the total population and its composition in terms of relevant breakdowns such as age, sex, socioeconomic status. Once a regression relation of this type is estimated, it may be used to predict student enrollments from projections of future populations. This method is discussed by Correa [7] . Such models are less useful from the point

of view of policy making than models based upon transition proportions, for the nature of the dependence of the parameters of the regression equation upon policy decisions is difficult to establish.

D. Cost-Benefit Models

Models of this type have as their primary function the evaluation of costs and benefits associated with proposed educational programs so as to guide policy makers. Though both of these aspects of an educational plan present difficulties, the problems involved in estimating costs are in general not quite as formidable as those involved in estimating benefits (see Mood [19]).

At least two major questions need to be resolved before benefits themselves may be tackled: What are the goals of an educational system, and what effect does an educational program have on the attainment of these goals? A consensus on goals in a pluralistic society is not easy to achieve. A first step in this direction is the clarification and analysis of the goals which are associated with individual educational programs under review. Estimates of impacts of educational programs are limited by inadequacies of our knowledge of the technology of the educational process, i.e., of the relation of educational inputs to educational outputs. Needed is the ability to isolate the effects of the educational system on educational achievement from the effects of genetic factors and of environmental factors such as socioeconomic status and home life; and, in addition, the ability to determine the relative impacts of different educational procedures or techniques. All this presupposes the existence of adequate measurements of educational achievement. For certain types of achievement, such as subject proficiency, existing tests are adequate and have been in widespread use. The attainment of other educational goals, such as creativity, self-reliance, intellectual curiosity, the development of humanistic values, are less amenable to measurement.

Methods of estimating costs of introducing changes in an educational system are discussed in considerable detail by Edding [11]; the following are some of his conclusions. Costs of implementing an educational program may be evaluated by analyzing the effects on school expenditures of the changes that the program would incur, e.g., changes in total enrollment, structure of enrollments (by age, school type, location), length of school day or year, length and structure of school courses, number and types of schools, location of schools, student-teacher ratio, level of utilization of school buildings and equipment, etc. Analysis should be made in terms of unit outlay per time period, e.g., annual expenditure per student, per teacher, per square foot. In estimating the outlay per student associated with an educational plan, the problem arises of defining the number of students. A satisfactory definition is that of average daily attendance (ADA), which is the aggregate days

the pupils were in school during the year divided by the number of days school was in session. Initial outlay is not usually an adequate guide for making investment decisions; account should be taken of subsequent maintenance and future utilization. Estimates of capital costs may be improved if they are geared to the degree of utilization as well as to the length of life of the capital good. Forecasts of current unit outlay may be based upon past experience, which indicates that the major expenditure per student is for personnel and that the proportion of this expenditure to other current outlay seems to be stable; it should be noted, however, that this situation may change if a significant amount of teaching is performed with the use of teaching machines.

- A cost-effectiveness model for the analysis of Title I proposals was formulated by Abt [1] for the U.S. Office of Education. Title I programs, which are geared to the disadvantaged, may provide for teacher increases, audiovisual devices, TV sets, new textbooks, etc. The purpose of the model is to evaluate alternative Title I programs in elementary and secondary edcuation for the same community. The model compares costs and effects of alternative programs with expected results if no changes were introduced. A school submodel estimates the impacts on school and students of the adoption of a Title I program. Inputs to this submodel are four types of partially educated students, stratified by race and income, and educational resources (teachers, equipment, facilities, community environment); outputs are changes, by student type and grade, in achievement, truancy, dropouts, and numbers of graduates, that are associated with the program under evaluation. Achievement is measured by achievement tests and scored according to grade level. Equations to be estimated represent relations between changes in school environment and changes in achivement and attitudes of students; it is initially planned to make such estimates by means of regression analysis of historical data. A community submodel relates school and student changes to community changes such as change in earning potential and change in equality of educational opportunity. Direct and indirect costs of programs are estimated; judgmental valuations of the changes in student, school, and community characteristics associated with a Title I program are to be introduced to estimate the program's value. The efficiency of a program may then be defined as the ratio of its value to its cost; obviously such an index is highly subjective. Finally, in connection with data base preparation, it is planned to include analysis routines for checking for errors of omission and inconsistencies.

- A cost-benefit model for allocating resources between general and vocational education was formulated by Correa [8]. The factors considered are the costs of each type of education, the

expected incomes of the educated, and the total budget for education. If it is assumed that in the case of vocational training expected income decreases with the number of students educated, the problem of maximizing the total yield of the two types of education, subject to a budget constraint, becomes a quadratic programming problem, for which a solution may be obtained.

- Hirsch [15,16] recommends the development of program budgets which may be used in allocating limited resources among competing educational activities, in contrast to comptroller's budgets that have as a primary function the guarding against carelessness or misappropriation. Program budgeting is a planning process in which expenditure information is organized in terms of programs that are associated with specific outputs and that are broken down into operationally useful components, such as manpower, material, equipment, and buildings, which can be recombined into alternative programs. Effectiveness is increased if the programs are defined with a minimum of overlapping and if competitive programs or components are identified. Once the expenditure information is organized, benefits associated with the programs are estimated. It is suggested that one of the most tangible measures of the benefit to society of a student's education is the student's incremental earnings. Programs are selected on the basis of cost-benefit analyses of alternative courses of action. It is recommended that because of the pluralistic nature of educational administration in the U.S., adequate communication should be established among the different educational jurisdictions with regard to budget plans.

E. Models of School Activities

Suppose a school program is classified into activities; these may be individual courses or activities within classes such as lectures, discussion sessions, closed circuit TV, etc. Models for projecting student participation in such activities may be used, together with assumptions about educational technology to be employed, to assist educational planners in estimating demand for teachers, facilities, materials, etc.

- System Development Corporation has developed a special computer program EDSIM for simulations of this type [6]. This program is based upon a tree structure where branches represent activities; at each branching point a student has a set of alternative choices. A rule is a set of probabilities associated with alternative choices at a designated branching (decision) point. The structure of the tree depends upon the set of activities, interrelations among them, such as prerequisites or parallel courses, and the possible lengths of times for activities. Students may

be stratified according to academic ability with durations of activities geared to ability; thus, the bright student may complete courses in less time than the less able student. Also transition rules for moving from one activity to another may be dependent on student ability. At the end of each time period, the activities of students during the next time period are simulated. In this way, simulated individual records are created for each student. This program may be used either to simulate student flows through existing school programs or to study the consequences of alternative innovations in school organization. The EDSIM program has been applied to several school systems; it may be employed to simulate flows of groups of students, e.g., classes, as well as individual students. Outputs of the model are summaries obtained from the simulated records; these may be designed to suit the needs of school planners in anticipating the impacts of individual pathways and rates of advancement through the school curriculum on the distributions of activities and on the resulting resource requirements.

F. More Extensive Models with Demographic, Economic, and Other Components

Once demographic, physical, and economic submodels of an educational system have been developed, these may be combined into a single model which takes explicit account of the interrelationships among its component parts. The primary determinant of such a simulation may generally be taken to be the distribution of students among the sectors of the educational system. The numbers of teachers and other personnel and the amounts of capital investment, materials, etc. would then be geared to the student populations in accordance with the educational technology assumed.

- A model of this type was developed by UNESCO [33] to simulate educational development in Asian countries for 1965-80. The driving force of the model is a student population flow submodel of the type described in section (A) above. The demand for teachers is determined by assuming appropriate student-teacher ratios. Enrollments in teacher training institutions which are needed to satisfy these requirements are then estimated. Total recurrent and capital costs are analyzed on a per capita basis, and subdivided into various categories which may be costed separately, such as per-pupil teacher salary cost, per-pupil cost of books, cost per unit-area of school plant construction, etc.

III. MODELS OF THE ECONOMY WITH THE EDUCATIONAL SYSTEM AS A COMPONENT

A. General Remarks

This section is concerned with models in which the educational system is one of several components and in which relations among the components are modeled. Educational institutions are viewed as producers of outputs that are employed by the different sectors of society. The educational system, viewed as an activity, is less susceptible of quantitative analysis than are manufacturing or other physical production processes, for its inputs, its outputs, and the functional relationships between its inputs and its outputs are more difficult to determine. In the case of inputs, an investigation of human inputs (students and teachers) brings one fairly close to the frontiers of educational knowledge. A prerequisite for a thorough understanding of the educational process is the identification of those characteristics of human inputs which are strongly related to educational attainment. If, for example, preschool environment, socioeconomic status, parents' educational attainments, and so forth, are important determinants of the effectiveness of educational techniques, then it is necessary to classify student inputs according to these criteria in order to be able to predict outputs of educational processes.

Similarly, the difficulty of measuring the outputs of an educational institution is a function of the definition used. If, for example, outputs are defined as the changes in the students due to the educational process, at least three questions arise: What qualities in students are to be measured? What sorts of measurements on students should be made at the beginning and at the conclusion of each educational time period? To what extent is the educational system responsible for these changes in students? The answer to the first question depends upon the goals and functions of education that are assumed; adequate solutions to the remaining questions will rely upon psychological testing methods and statistical techniques, some of which may still be in developmental stages. In order to bypass problems of this order of magnitude, both from the point of view of theory and availability of statistics, in many models of the type considered here, a simple definition of output is employed, i.e., the numbers of students at different educational levels.

Problems involving the functional relationships between inputs and outputs of educational processes may be even less tractable than those concerned with the definitions of educational inputs and outputs. Gaps in our knowledge and understanding of the technical and biological processes by which learning takes place distinguish studies of educational technology from those of production processes which may be analyzed in terms of known physical or chemical relations.

Other distinguishing characteristics of the educational sector result in the market being less important as a determinant of the technology selected than in the case of other sectors of the economy. These are (1) the considerably longer time period required for production and (2) the control exercised by local voters and bureaucrats whose decisions are not necessarily geared to the economic needs of future generations. Another contrast with other sectors which is of interest to note is that the educational sector produces one of its major inputs, i.e., teachers.

Models which link the educational system to other sectors of the economy are concerned with relations between the educational attainment of the population and the technology of production of the society. Educational attainment (inventiveness and technological know-how) is a major determinant of the technological state of a society; and, in the reverse direction, the technology of the production processes determines occupational requirements and these, in turn, are associated with educational attainment.

In recent years, considerable research has been focused on the role of human resources in economic development. (See, for example, Becker [3], Machlup [18], Schultz [27, 28, 29], Vaizey [35], OECD [23].) Schultz's analysis presents strong evidence for the necessity of developing a new theoretical framework for explaining productivity. Though traditional economics attributes economic growth to two sources, labor and capital, the national income of the U.S. has been increasing at a much larger rate than either the labor force or the stock of physical capital. Schultz's thesis is that there exists a third or residual component of economic growth and that education, which may be regarded as investment in human capital, is an important key to this unexplained growth. Theoretical contributions along these lines which clarify the processes by which education is converted into technological advancement may be expected to result in significant refinements in models of this type.

In connection with the determination of occupational requirements associated with a given technological state, it may be noted that the Bureau of Labor Statistics has prepared occupation-by-industry matrices which present occupational distributions for each industry. The Bureau plans to update this information periodically. However, the establishment of standards of educational attainment for occupations is difficult, for people with different levels of formal education may have the same occupation. This is due to differences in aptitudes and differences in job experience. Both of these factors--intelligence and on the job training--entail measurement problems.

Models in which the educational sector is one of several interrelated components may be implemented either for the nation as a whole or for a

region. Regional simulations may be more difficult to achieve than national ones for two reasons: less adequate data collection and certain intrinsic differences in the problems. In general, regional data gaps are greater than national ones. Also, lack of consistency in reporting techniques, by the same local agency for different time periods, as well as among local agencies, is not uncommon. Correspondences between data collected by different local jurisdictions may not be easy to determine because reports are based on different geographical area units. It is expected that the establishment of regional information systems, which is being encouraged by the U.S. Department of Housing and Urban Development, will eliminate some of these difficulties.

Some problems encountered in regional economics are less troublesome on the national level, for they arise from the greater dependence of regions on external environments. For regional models, it is important to distinguish between those activities which serve a national market and those which serve local needs. In general, the smaller the region under investigation, the more vulnerable it is to external factors, on the one hand, and the more difficult it is to obtain adequate information about the nature of its interactions with the outside world, on the other hand. For both of these reasons, the problem of openness is less tractable in the case of regions than for the nation as a whole. In addition, the theoretical structure of regional economics may, in the course of its development, be expected to involve activities and concepts that are specific to regions and that do not possess exact national counterparts.

B. Examples

- A macro-model which relates the demand for workers by level of education to the volume of production has been developed by Jan Tinbergen and H. C. Bos [32] . Though this model is fairly simple (relations assumed are linear) and highly aggregated, it has been successfully implemented in several European countries. Models of this type, which relate the educational system to the economic development of the country, were utilized in Spain, Turkey, and Greece, in connection with the Mediterranean Regional Project of the OECD [24] . The models used for these countries are modifications of a basic model; this basic model makes the following assumptions:

  (1) The labor force with a secondary education is a fixed proportion of the total volume of production of the country.

  (2) The labor force with a secondary education during a given period is the sum of those with a secondary education who survived from the previous period and those who entered the labor force during the period.

(3) The number of students with a secondary education during one period are distributed during the subsequent period between those that enter the labor force and those that continue their education.

(4) The workers that enter the labor force with a third-level education during one period were students in third-level education during the previous period.

(5) The labor force with a third-level education during a given period is the sum of those with a third-level education who survived from the previous period and those who entered the labor force during the period.

(6) The number of workers with a third-level education is a linear combination of the volume of production, the number of students in secondary education, and the number of students in third-level education.

These relationships provide a linkage between the educational system and the volume of production. Relations (2) through (5) are essentially of a bookkeeping nature; relations (1) and (6) describe more basic linkages between the educational system and the economy. This model provides planners with a tool for gearing the educational system to the needs of economic development. The system may be studied under alternative assumptions about the path of the production function. Requirements for foreign aid in the form of trained manpower in order to carry out economic development programs may be calculated. Also schedules for releasing foreign skilled labor and replacing it with native domestically trained labor may be computed with the aid of a model of this type.

The model may be elaborated by introducing modifications such as disaggregation of the educational system so as to provide for more stages in the educational process and disaggregation of production into a number of activities with different manpower requirements. Refinements which increase the level of detail at which relationships are treated as well as the introduction of nonlinear relations should result in the formulation of a planning model which more adequately represents the interdependencies between a developing economy and the educational system.

- Jean Benard [4] formulated an input-output model in which activities are divided into three sectors: an educational sector, a commercial economic sector, and a skilled manpower producing sector. The educational sector is composed of educational activities, which are regarded as producers of knowledge required for the skilled workers of society. Outputs of this sector are measured by the numbers of students enrolled at different educational levels; finished products of this sector are measured by numbers of graduates. Purely cultural functions of education, as well as pure research within universities, are not considered in the measurement of the output of the educational sector.

The commercial economic sector consists of industrial activities in which the goods and services produced are marketed. Outputs of activities in this sector are physical quantities, i.e., values at constant prices for a base year. In this model, the only non-commercial activities which are treated endogenously are educational.

The third sector is a notional sector that is conceived of as producing skilled manpower, which is employed in the other two sectors. More exactly, the activities of this sector relate to the classification according to skill of individuals leaving the educational sector and to promotions of those already employed in the commercial economic sector.

The stock of workers with a given skill at a given time is derived from the educational sector and from the economic sector; the latter sector contains workers who were trained on the job and have just attained the skill level as well as those who had previously worked at the given level of skill and who are continuing to do so. The outputs of the manpower sector are workers classified by skill level.

Fixed technical coefficients for the activities of the economic and educational sectors are specified for inputs of labor by different levels of skill as well as for inputs of intermediate products. Capital coefficients which reflect gross investment requirements in order to increase productive capacities are also fixed. The model does not provide a mechanism for the choice of technology; changes in technical processes are exogenous to the model and are reflected in changes in the input-output coefficients.

The model is a linear programming model in which a preference function is maximized subject to certain constraints. The preference function is a linear combination of indicators of standards of living during a given time span and of measures of production potential and of skilled labor potential created during this time span, all discounted to present value. The outputs of the model are outputs of the activities which are included in the educational and commercial economic sectors, for each time period in the time span of the model.

Constraints of the system are physical, relating to resources, labor, and production capacities. A constraint to insure that cultural demands of society are satisfied requires that at least a certain proportion of young people continue their education. It is possible also to introduce a budgetary constraint on education expenditure.

The exogenous variables of Benard's model are the following:

(1) All variables relating to the initial period.

(2) Variables relating to agriculture, foreign trade, and governmental activities.

(3) Demographic variables: pupils enrolled in the educational system, net immigration by level of skill, rural-urban migration.

(4) Variables relating to budgetary ceilings for educational expenditures.

. The U.S. Office of Education is at present developing a model of an urban educational system which links the system to the economic and sociological structure of the urban region within which it is embedded (see reference [5, 21]). This work is still in an experimental stage; it would seem that even modest progress along these lines will require considerable effort. Factors to be considered in such a model are economic growth, industrial and commercial location, residential location, land use patterns, transportation facilities, and possibly fiscal policy, as these relate to the educational system, as well as the interrelationships among these components.

The model will contain three submodels: urban, school, and cost. The urban submodel is to deal with those characteristics of the area which relate to the location and socioeconomic characteristics of school children and their families. The school submodel will deal with organizational characteristics of the educational system, in particular, with locations of school plants. The cost submodel will compute costs of physical activities specified in the other two submodels. Some of the cost elements to be estimated are the construction of new plants, land acquisition, personnel staffing, current operating expenses, transportation, financing of capital. Finally, alternative policies are to be evaluated in terms of costs and benefits, and benefits measured in terms of certain operational criteria.

The development of a generalized regional model outside of the framework of the particular geography of a region requires the extraction from regional systems of those factors which they share in common; whether or not this procedure is useful will depend upon the relative importance of such factors in explaining the workings of individual urban regions.

IV. CONCLUSION

A. Models Included in this Survey

This survey has been concerned with two kinds of models--those that focus primarily on educational activities and disregard interdependencies with other sectors of society and those for which education is one of several interrelated economic activities. Though the boundary between these two categories may be to some extent arbitrary, this dichotomization differentiates between models that are of relatively limited scope and those that encompass the economy as a whole. Models of the first category may serve as components of models of the latter category.

Models of the third category--models of the learning process itself--, though not included in this survey, may be employed for educational planning. An example of such an application as well as references to other applications, is contained in reference [26]. Models of this type may be used as components or building blocks of models of the educational system for which educational technologies are not assumed but are determined in accordance with optimization criteria. In most of the examples presented in this paper, educational techniques are assumed; variables related to these techniques are exogenous. The expansion of knowledge of learning processes may be expected to result in the development of planning models which include among their outputs optimal educational technologies. Such models would take account of the quality of education as well as of cruder measures of educational output, e.g., numbers of students at different educational levels, which are utilized in models described here. The development of successful simulations of learning processes will make possible significant advancement in the structure of educational planning models, both from the point of view of level of detail and of variables considered.

B. Some Data Considerations

A crucial consideration for the implementation of a model is the availability of data; adequate data is required for the calibration of a model (parameter estimation), as well as for the determination of the values of the exogenous variables of the model. The development of models and the extension of data collection procedures should, from the planners' viewpoint, be closely related activities, with the formulation of new models stimulating the collection of appropriate data, and with improvement in the quality and types of data collected giving rise to new models which utilize the new information.

In general, educational statistics tend to be aggregated; schools report total enrollments for each class, numbers of teachers by subject, and so

forth. This type of reporting system, even when classifications are not highly aggregated, provides information on stocks (e.g., distributions of students among educational activities) but is not usually adequate for obtaining reliable information on flows of students between educational activities. The latter information is needed to estimate the transition proportions in demographic models of the type described in Section II-A. Interest in such models and the subsequent recognition of this data gap have been a factor in recent appraisals of the merits of introducing individual data systems; see for example, Chapter VIII of OECD [25] .

In an individualized data system, the records of each individual contains information on his educational history, on factors associated with educational performance, and on his constant characteristics (date of birth, parental background, race, etc.). With the use of modern data processing techniques, in particular the information retrieval capacity of modern computers, information with respect to the characteristics included in the individual records would be readily available for any groups of students that are of interest to educators. Similarly, the establishment of individualized data records for teachers would make possible detailed tabulations for various categories of institutions and teachers.

C. A Hierarchy of Planning Models

According to R. Frisch [13] , the process of constructing mathematical models for planning purposes consists of several stages, each of which is a prerequisite for the next. The first is the formulation of an analytical scheme which represents the system being modeled. Alternative assumptions about the values of exogenous variables and of parameters correspond to alternative outcomes, i.e., alternative forecasts of the endogenous or output variables. At this stage, the model builder is an on-looker who seeks to answer questions about what will happen under plausible alternatives which are defined in terms of values of exogenous variables and parameters. Most of the models discussed in this paper fall in this category.

In the next stage, the viewpoint is shifted from that of an on-looker to that of a policy formulator. Variables that can be influenced by policy decisions are identified; such variables are referred to as control or decisional variables. It is conceivable also that some of the relations of the model could be modified by means of policy decisions. Feasible policy alternatives are translated into values (or ranges of values) of control variables and, possibly, into modifications in the model formulation. When connections between policy decisions and control variables have been established, simulations will provide information on the consequences of alternative policies.

The last stage of this hierarchy, which introduces an optimization approach, involves the selection of a policy from a set of alternatives on the basis of desired outcomes. Two questions arise. What are the targets to be achieved and what criteria should be introduced to measure how well a policy achieves the desired targets. Targets will be expressed as restrictions on the values of the output variables. The second question may be answered by means of a preference function, a function of the variables which measures overall performance and may involve such factors as cost, physical expenditures, speed with which target is reached, etc. Once these questions have been answered, the next step is the determination of the policy which maximizes the preference function subject to all of the constraints of the model; this may involve some not too tractable mathematical problems.

The selection of a preference function is clearly a difficult problem in a democratic society; this process may involve the evaluation of several alternative preference functions in terms of the consequences of adopting them. The problem of resolving conflicts of interest among different sectors in society becomes less formidable if such consequences are systematically reviewed.

D. The Outlook

As has been indicated above, many of the models included in this survey are primarily representational and do not focus on policy-sensitive or instrumental variables except incidentally. Furthermore, initial representations may be considered to be first approximations to reality. Better descriptions of reality should result from the introduction of non-linear relationships and more disaggregation. In primarily representational models, policy-makers may approach the task of identification of those variables whose values can be manipulated by policy-decisions in an ad hoc fashion.

A successful model building effort will thus involve the formulation of a model which is based upon a representation of reality which is sufficiently accurate for the purposes of the planners and which takes explicit account of feasible alternative policies and upon the selection of a well-chosen preference function to determine optimal policy.

Unfortunately, this is not the entire picture. Successful model implementation is dependent upon the availability of adequate data; and, furthermore, the running of a model over a period of time may require updating of data at appropriate intervals and at critical decision points. Data collection procedures are thus crucial to model implementation.

When the stage is set for implementing a well-formulated planning model, still other difficulties present themselves. In practice, it may not

be feasible to determine the optimal policy analytically, but it may be necessary to rely upon trial and error and continuous adjustments in policies to narrow the gap between goals and reality. Initial estimates of the effects of policies on the values of instrumental variables should be subject to continuous revision. Similarly, parameter values may require updating. Periodically, the performance of the system will need to be reviewed and gaps between model predictions and reality evaluated so as to maintain a course which runs as close to the target as possible. Modifications of the relations in the model and of parameter values, as well as adjustments in policies and planning programs, would be part of a continuous ongoing process--a process of adaptive control. Thus, systematic decision-making of this type is not a one-shot affair but a continuing process of policy and model adjustments which depends upon an adequate flow of new, up-to-date information on the performance of the system. Observations are made on model outputs, on the real world and on the impacts of policy changes on both the model and the real world. Humans (e.g., educational planners) will make the necessary adjustments, and the effectiveness of their actions will depend upon their experience and understanding of the system. There are, of course, objective limitations to the effectiveness of control which are not related to the competence of the human controllers, for there are obviously many factors of the educational scene which cannot be influenced by educational policy.

The picture portrayed here is one of formidable theoretical and statistical obstacles to the development of adequate planning models. Though many of the models under investigation are still in fairly exploratory stages, the extensive current interest in such efforts may be some indication of a growing sense on the part of planners of the importance of such endeavors, and may provide some hope for significant theoretical breakthroughs in the not too remote future. Due to the complexity of the educational system (vast numbers of inter-dependent variables, complicated and not too well understood relationships, changing patterns), as well as the complex array of demands upon the system from other sectors of the economy, mathematical models may evolve into indispensable tools for rational and consistent planning.

E. The Role of Mathematical Models in an Educational Policy Research and Support Center

This survey of mathematical models was sponsored by the Pilot Center for Educational Policy Research and Support Center (EPRSC) at SDC with two purposes: (1) to provide an introduction to the field, for educational planners; (2) and to assist the Pilot Center staff in the design of a permanent Center. The implications of this analysis for the selection of fruitful activities for a Center will now be discussed briefly. A subsequent document on the design of the Center will consider some of these questions in greater detail.

If, as this paper argues, mathematical models may be expected to play a significant part in the formulation of educational policy, an analysis of possible activities of an educational planning center would not be complete without explicit consideration of the role of models with respect to such activities.

The development of a complex computer-based educational planning model is a truly interdisciplinary activity; it represents the joint efforts of educators, economists, demographers, as well as mathematicians, programmers, and statisticians. The specialists of the former group provide a knowledge of the interrelationships among the variables considered in the model. The mathematician formulates these relationships in mathematical language, and the programmer translates the mathematical representation into instructions for the computer. The statistician, together with appropriate specialists of the former group, estimates the parameters of the model and develops adequate data collection procedures. One role for the Center is the development of new models or improved models for educational planning.

Though a model is implemented and utilized for planning purposes, it should not be regarded as final. Feedback from the model outputs and better understanding of interdependencies among the variables of the model will lead to revisions of the theoretical structure of the model, as well as of parameter values. In the course of utilizing a model for planning purposes, modifications and refinements will be introduced so as to obtain better approximations to reality; and such changes in a model will require the same type of interdisciplinary team work as the initial development of the model. It is in this area that an EPRSC could play an important role, namely, in the improvement and adjustment of models that are already being implemented. Such a center may be expected to provide expertise, as well as liaison between policy-makers and theoretical workers in the disciplines referred to above, both of which are needed in order to construct better models. The contribution of the center to establishing connections between policy alternatives and control variables could prove to be especially significant. The improvement of a model's sensitivity to policy by means of a better calibration of the results of policy decisions will require the coordinated efforts of educational-policy makers and experts in the disciplines involved in model development. A second role for the Center is the improvement of models, in the course of their implementation, with special emphasis on delineating relationships between policy decisions and the variables of the model.

A third role for the Center is the implementation of computerized models with the following objectives: (1) to assist the Center in its planning for the future, (2) to support users in their planning activities, or (3) to provide familiarity with models and training experience in the implementation of models for users of the Center. It is suggested that for the

last purpose, a simple demographic model based upon transition proportions be programmed at the Center and run under various assumptions about the time paths of the parameters. Users of the model could also be assisted in estimation techniques and in data collection procedures.

A fourth role for the Center is to provide support to agencies that wish to implement educational planning models. One form of such support is the establishment of a well-documented library of existing models. A depository of programs of models that have been implemented would serve to eliminate considerable duplication of effort.

It is not feasible to make progress in all four of these directions during the initial phase of the Center's operations. It is suggested therefore that the beginning efforts be fairly modest. Two tasks could be started during the first year. The first is the implementation of a demographic model for a local or regional jurisdiction. This would assist the educational policy makers of that jurisdiction and would also serve as a powerful training tool for planners and future users of models. The second is the establishment of a library of adequately documented programs for educational planning models. As may be noted from the reference listings, educational planning models are developed by a variety of different organizations - government agencies, international committees, research institutes, universities. The acquisition, assembly, and documentation of these models could provide considerable support to new users of such models. In addition, a clearinghouse of this type might encourage greater communication among the different groups that are engaged in model-building efforts.

ATTACHMENT: A DEMOGRAPHIC MODEL BASED UPON TRANSITION PROPORTIONS

Assume that the population of the region for which the model is to be implemented is divided into n mutually exclusive categories, i = 1,..., n. Let $p_{ij}(t)$ be the proportion of people in category i at time t who will be in category j at time t + 1. (Here time t means the beginning of t^{th} time period). Let $N_i(t)$, i = 1,..., n, be the population of the i^{th} category at time t. Let $M_i(t)$, i = 1, ...,n, be the number of people who entered category i during period t but were not in the region during the previous period (births and migration to the region). The number of people in category i at time t + 1 is given by

$$(1) \quad N_i(t+1) = \sum_{k=1}^{n} p_{ki}(t)\, N_k(t) + M_i(t).$$

If, for the initial time period, the population of each category is given and if, for a sequence of consecutive time periods, transition proportions $p_{ij}(t)$ and new entries to each category $M_i(t)$ are given, the populations of these categories for each of the time periods may be computed by repeated applications of the above equations.

If the transition proportions do not depend upon tht time period, we may write $p_{ij} = p_{ij}(t)$. In this case, the matrix of fixed transition proportions may be written:

$$(2) \quad P = \begin{pmatrix} p_{11} & p_{12} \cdots p_{1n} \\ p_{i1} & p_{i2} \quad\quad p_{in} \\ p_{n1} & p_{n2} \cdots p_{nn} \end{pmatrix}$$

Equation (1), for this case, becomes:

$$(3) \quad N_{t+1} = P'\, N_t + M_t,$$

where P' is the transpose of P, and M_t and N_t are column vectors of migrants and populations, respectively. If the assumption of fixed transition proportions is made, once the elements of the matrix P have been estimated, they may be utilized for consecutive applications of the forecasting equation (3).

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THE PUBLIC'S SHARE IN SHAPING EDUCATIONAL POLICY: A PILOT STUDY

by

Thorington B. Robertson

APPENDIX D

TABLE OF CONTENTS

I. INTRODUCTION

This paper discusses a pilot study being conducted by the staff of the SDC Educational Policy Research and Support Center. The objectives of this study are:

- To experiment with methods for ascertaining group educational "wants" as a basis for more extensive research in this field.
- To ascertain what a selected number of groups within the United States want from future educational programs.
- To examine the extent to which the several groups agree or disagree with respect to what they want.
- To expose potential issues raised by the impacts of these wants upon current trends affecting education.

The project is on-going and will not be completed in its first phase before February 1968. For this reason, the discussion is limited to reporting on the methods used so far, the preliminary evaluations of these methods, and some tentative findings.

II. ASSUMPTIONS

This project developed out of early discussions by the Center's staff and the SDC panel of senior consultants. These led to the conviction that what the public wants for the future helps to determine the future. Thus, as changing times and events keep presenting new problems and new challenges, one is forced to choose between two or more courses of future action. Each such choice determines to some degree the events that will follow and thereby helps to shape the future that will eventually come to pass. Each choice also tends to sacrifice other futures which may have been possible. The importance of this rests on the fact that each decision is almost invariably influenced by the things the chooser wants for the future, by his hopes, values, and aspirations.

In the case of educational policy makers, however, the things wanted are seldom entirely personal. Rather, they tend to reflect the hopes, values and aspirations of some constituency, some group of citizens for whom the policy maker acts. Hence, what people in general want, influences choices of educational policy and action. The public shares in making educational policy--even though the ways seem obscure and the means uncertain.

It should further be recognized that what people are capable of wanting with sufficient force to affect policy, depends on what they think is possible. It was only when reaching the moon seemed actually possible, for example, that a policy to build the necessary vehicles and support

systems could be seriously considered. Unfortunately, policy making in all fields suffers from a scarcity of information about what is really possible. Only by a deep and continuing examination of trends, potential "breakthroughs," and conceivable major changes in the course of events, may the full range of possibilities be canvassed. Such an examination can greatly expand our perceptions of the alternative futures that may lie ahead, and hence sharpen and define expression of our wants. Policy decisions can then be made with greater precision and confidence.

Short of complete foreknowledge, different groups of people will differ in the value they place on each alternative future. Particularly in the field of education, what we are calling "wants" are not now and probably never will be uniform throughout the country. Even on the most general plane, they appear to differ by class, occupation, ethnic group, region, political viewpoint, and many other factors. These differences reflect differing group needs as well as differing values and aspirations stemming from the diverse backgrounds of the people of the United States. The diversity of wants thus has differing impacts upon policy decisions. To assess fully what is possible, requires an exploration not only of trends, but some estimation of how wants may modify or even reverse the course of trends.

Although the original program for the SDC Pilot Center for Educational Policy Research had not established a specific requirement for the testing of this set of assumptions, it was decided that their importance justified an investment of effort in this field.

III. PLANNING STRATEGIES

Initial plans for this project called for the use of two strategies. The first was based on the "linking pin" concept. The immediate resources of the Center were augmented with the help of friends and associates who could arrange meetings of community groups at which future wants for education could be debated. Thus, Alvin Toffler of the New School for Social Research in New York volunteered to act as the linking pin to a specially selected group of futurists and interested leaders on the Atlantic Coast, and Gerald Newmark of SDC's Research and Technology Division acted as a linking pin to "Operation Bootstrap," a self-help group of black people on the Pacific Coast.

The second strategy was based on a modification of the "Delphi technique." This method in its original form elicits responses from a carefully chosen group of experts to a a set of questions concerning future developments. By providing to each, some information about the responses of others, and re-asking some of the questions, consensus can eventually be achieved in some cases on such matters as when a given development will occur. The modifications of this technique which were planned for the present project involved the selection of respondents according to the population

groups which they represented (instead of their authority as experts in a particular field of knowledge) and examination of systematic divergences as well as convergences of opinion within and among the several groups.

It was realized that, during the pilot phase, time and available resources would not permit sampling the many class, ethnic, economic, occupational, regional, political and other groups in the United States in any scientific way. The best that could be attempted would be a preliminary exploration of the wants of a small number of groups. This effort might be considered as the first step of a kind of feasibility study.

Constraints of time and resouces also precluded the full use of Delphi technique mailed questionnaires during the first six months of the Pilot Center operation. It was therefore planned to employ a Delphi-like structure in the conduct of one or two of the meetings. To aid in the selection of representative groups, a matrix arranged by level and sector divided the total population into twenty-six subpopulations of education "providers" and "users," and suggested organized groups which might be considered as representative of each subpopulation. This matrix is shown in Figure 1.

IV. CONDUCT OF THE PROGRAM

The Center's staff has sponsored four meetings to date, three in Los Angeles and one in New York. The groups involved were as follows:

• Community Resources Panel	Policy Makers and Educators
• "Operation Bootstrap"	Representatives of the Black Community
• System Development Corporation	Human Factors and Training Professionals
• New School for Social Research	Futurists, Writers, Educators

A discussion of each of these meetings is presented in Attachments A, B, C, and D of this paper.

Dr. Olaf Helmer of the RAND Corporation, [illegible] Charles Carey, consultant to SDC and to the Institute of Government and Public Affairs, UCLA, have provided advice and counsel regarding the structuring of meetings and questionnaires, with particular reference to the application of Delphi technique modifications.

Work planned for the remainder of the pilot phase includes, if resources permit, meetings with other groups shown on the planning matrix and the completion of two rounds of mailed questionnaires.

SOME SUBPOPULATIONS HAVING SPECIFIC NEEDS (AND PRESUMABLY "WANTS") RELATING TO THE SUPPLY AND USE OF EDUCATION.

	LEGISLATIVE	EXECUTIVE
FEDERAL LEVEL →	SENATORS CONGRESSMEN	USOE
STATE LEVEL →	STATE LEGISLATURE STATE BOARD OF EDUCATION	STATE DEPARTMENT OF EDUCATION
COUNTY - DISTRICT LEVEL →	BOARD OF EDUCATION	DEPARTMENT OF EDUCATION
INSTITUTION LEVEL →	PRINCIPALS P.T.A. OFFICERS	TEACHERS

USER LEVEL	INDUSTRY	COMMERCE	FINANCE	SERVICE	AGRICULTURE	PROFESSIONAL	COLLEGES	UNEMPLOYED	MISCELLANEOUS
EXECUTIVES	MANUFACT. ASSOC.	RETAIL CR. MEN'S ASSOC	BANKERS' ASSOCIATION	OWNERS	OWNERS	DOCTORS LAWYERS ENGINEERS	PRESIDENTS REGENTS	OVER 40 CLUB	CONSULTANTS
WORKERS	LABOR UNIONS	LABOR UNIONS	EMPLOYEES	EMPLOYEES	FARM LABOR	NURSES LAW CLERKS DRAFTSMEN	FACULTY STUDENTS	LABORERS HIPPIES	ARTISTS TRADESMEN BOOTSTRAP

FIGURE 1. PLANNING MATRIX

V. TENTATIVE FINDINGS - METHODS

Although the number of meetings and people included so far in this project is very small, several findings have been noted which should be taken into account in future efforts of this type. Among these are the following:

- Even when talking ostensibly about longer range futures (twenty to thirty years), most attendees were unable to imagine a world situation that is fundamentally different from the present. The effective range of speculation regarding the real world was actually about five to ten years.

- The describing of a hypothetical longer-range future world at a meeting was insufficient to overcome this inability among the attendees.

- Non-structured discussions about future education tended to concentrate on present problems and immediate solutions.

- While the bringing together of people representing different groups in the population tended to expose differences of opinion and thus raise issues, it did not fully expose group attitudes and shared points of view. In heterogenous groups, the firmness of a position tended to be proportional to the personal forcefulness and persuasiveness of the individual spokesman rather than to the strength or conviction of the constituency he represented.

These tentative findings suggest that:

- Minimum reliance should be placed on the imagination of attendees. One way to achieve this might be to describe as concretely as possible alternative future educational systems (rather than future worlds) covering a wide range of possibilities and then focus the discourse and observation upon which of the several systems is preferred and why.

- To find out the wants of a particular group in the population, meetings might be composed of representatives of one group only. By this means, the primary identification of convergences and divergences of wants, and the detection of issues, would be based upon comparing the consensus of one meeting with the consensus of another, rather than upon comparing the opinion of one person with that of another.

VI. TENTATIVE FINDINGS - WANTS

In two of the four meetings held, each participant had an open opportunity to state what he wanted most for education without prior suggestion from the chairman. In one meeting, all discussion was limited to a preselected list of eight items. In another meeting, the expression of wants was open but the discussion was directed to consideration of a preselected list of five items. A detailed analysis and comparison of the opinions expressed at these meetings must await a later report. It is possible at this time, however, to summarize three salient points.

The first point is that all attendees at all meetings agreed (or at least did not disagree) that one of their primary wants is for a truly individualized education. What is meant by "individualized" was not always well defined, other than that it meant an education so fashioned that it could serve the needs of students as individuals. Among the characteristics of individualized education, the following were mentioned or seemed to be implied:

- It should provide a curriculum sufficiently diversified that each child can follow an educational path which is closely suited to his personal, intellectual or practical interests.
- It should provide an enriched educational program for all children capable of benefitting therefrom.
- It should provide for the special educational needs of the outstanding child, the exceptional child (physically or mentally), the disadvantaged child, the delinquent child, and the child with any other "non-normal" needs.
- It should allow for the continuous, unbroken upward progression of each child proceeding at his own best pace.
- It should permit each child to have a considerable voice in choosing the educational path he will follow.
- It should strive to make each child a self-directed individual learner.
- It should develop student self-instruction.
- It should permit each child to develop to the full extent of his capacities.
- It should provide for a variety of learning situations, individual and group.

- Where grouping for instruction is appropriate, it should provide that each child is grouped in each subject with his peers in that subject.

The second point is that, while everyone could name characteristics of the present educational system which a future system should not have, not one person was able to present a coherent description of a future educational system along with the major characteristics it should have. No one could project an ideal or utopian concept of an educational system for the future. (This is, perhaps, not surprising when one considers that the attendees included many people who have not thought deeply about either the future or education. It is much more surprising when one reflects that the attendees did include several prominent futurists and educators.)

The people taking part in the meetings often had very clear wants with respect to change, but evidently very unclear wants with respect to objectives. Many wanted action, but none had considered in detail the kind of educational system which would result from taking the action. In short, it appeared that, so far as these attendees were concerned, none subscribed to any "ism," philosophy, or school of thought which embraced the entire process and administration of a kind of educational system which was believed to be desirable now or in the future. Thus, there seemed to be no systematic clusters of wants.

The third point, is that at each meeting, a conflict was recognized between the need to educate each individual as a whole, "self-fulfilling" person, and the need to educate him as a member of a highly organized, technological society. In this area, disagreements were marked. They apparently polarized in one dimension about the concepts on one hand, that technology serves the "vested interests" or the "establishment" or, on the other, that it serves the entire social order. In another dimension, they clustered around the opinion that the claims of the individual have priority over those of society, or around the view that the claims of society must take precedence over those of the individual. The differences in opinion in this area, however, seemed to be reflections of personal bias rather than group consensus, although under the circumstances, this latter may be a premature observation.

As noted in the previous section, it apparently was very difficult for attendees to consider wants for future education divorced from the shortcomings of present education. At the one meeting (SDC professionals) at which two future states of the world were projected, it was found impossible to foresee what wants for a still longer range future might be. This evidently stemmed from the difficulty of visualizing the true nature of unfamiliar worlds.

VII. TENTATIVE FINDINGS - ISSUES

The relation of wants to issues is twofold:

- Wants may impinge upon or conflict with social trends and thereby raise policy issues.

- The wants of one group may conflict with the wants of other groups and thus generate still further policy issues.

Educational issues caused by both these conditions were debated during the meetings. A preliminary study of recording tapes indicates that there were other equally important issues which were not immediately recognized and therefore not discussed.

Examples of some of the issues involved can be derived from the three points discussed in the previous section:

- The widespread want for individualized education, if satisfied, would almost certainly aggravate severely the trend toward higher and higher total and per-pupil costs of education. Opposed to this, appears to be a trend toward stiffening taxpayer resistance to higher taxes. Policy makers' attempts to provide the facilities and equipment necessary to supply more individualized education are in many cases being thwarted by public refusal to approve school bonds and similar measures. Clearly the issue between individualized education and resistance to paying higher taxes is created by a conflict between a general want and a developing social trend.

- The wants for immediate action to improve present education, unaccompanied, as they often are by a vision of the kind of educational system such action is intended to produce, raises an issue between two groups: those who demand action to solve immediate problems, and those who insist on comprehensive planning and evaluation before action is taken.

- The wants for an education which will be devoted to producing whole, self-fulfilling people are evidently opposed to the wants for an education which will turn out people competent to maintain a technological society. The latter, in turn, would seem to be in conflict with the trends toward greater automation and concomitant increased leisure. Out of these conflicts arise such issues as: "What is education for?"; "What part of career training should be supplied by the school system and what part by employers and other institutions?"; "Is it the task of education to prepare the individual for the enjoyment of leisure time?"

In addition to the above, the following are samples of some of the other issues raised:

- Should the services now being provided free to some children (through well-baby clinics, police juvenile units, "Head Start" programs, playgrounds, art centers, hospitals, etc.) be transferred to the schools from the many public agencies now responsible for them so that all services can be fully integrated with educational, disciplinary, health, and cultural programs?

- Where can the line be drawn between what is a basic and necessary education and what is not?

- Is it the function of schools to educate or to train, and what is the difference between these concepts?

- Should the educational system be directed toward fitting people to the social order or toward changing the social order to satisfy the wants of people?

- Are there sectors in U.S. society (e.g., the black community) which are so different from the rest, whose needs are so unique, that separate school systems must be provided for them?

It is evident that some of these issues are closely related to issues derived from the development of the contextual map discusssed in Appendix B. The latter issues are generated by social trends seen more or less in isolation (although it is evident that many social trends are reflections of wants successfully pursued). For example, the issue of separate schools for black children is one facet of the following issue derived from the long-term trend toward an increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture:

- If existing educational institutions are resistant to change, should new institutions be created to replace them and staffed with new types of educators?

The extrapolation of trends and the exploration of wants are therefore complementary activities. Both raise issues, but they do so from different considerations. Together they present more facets of each problem than either could do alone.

VIII. CONCLUSION

This investigation of what selected populations want for and from education in the future, although conducted with limited time and resources, has broken ground in a field of great importance to educational policy making.

It has uncovered a few of the conflicting pressures within society which would appear to make the improvement of educational systems utterly beyond easy or simple achievement. It has shown that the wants cherished by one sector of the population may be both supported and opposed by those of other sectors. It has suggested that many wants are the reflections of social, economic, cultural and religious values which are held with deep conviction and expressed with strong passion. These wants and the values they reflect may well affect educational decision-making at all levels. In any envisioning of the future, they cannot be disregarded for they constitute one of the major elements from which the future itself will be made.

ATTACHMENT A

COMMUNITY RESOURCES PANEL MEETING

Place: System Development Corporation Conference Room, Santa Monica

Time: 9:00 A.M. to 12:00 Noon, July 13, 1967

Attendees:

Panel Members

Mr. Ralph Boynton
Vice President
Bank of America

Very Reverend Charles S. Casassa, S.J.
President, Loyola University
Los Angeles

Mrs. Georgiana Hardy
President, Board of Education
Los Angeles City Schools

Professor Harold Horowitz
Professor of Law, UCLA

Dr. Ira Robinson
Professor and Chairman, Department of
City and Regional Planning, USC

EPRSC Staff Members

Dr. M. Adelson, Director and Meeting Chairman

Dr. J. F. O'Toole, Jr.
Associate Director

J. Jaffe, Staff

T. B. Robertson, Staff

Dr. P. E. Rosove, Staff

SDC Consultants

H. Ozbekhan
Dr. H. Silberman

Dr. T. C. Rowan
Dr. Zivia Wurtele

This meeting in its more general aspects was reported in Appendix 4.4 to Progress Report No. 1 of the EPRSC (June 1 to August 31, 1967). Its importance to the investigation of wants for education derived from a pre-meeting request made by the chairman to all panel members. Each was asked to come to the meeting prepared to discuss his own three most important wishes for education in the future. As Dr. Adelson expressed it in opening the discussion:

> It is clear that with any sample of people you don't get all the viewpoints you want. We want to show, however, what happens when one confronts people with each other who have very different backgrounds, different points of view, and different problems, on the different levels....
>
> ...the question was, if you remember, if you had three, but only three wishes, for education in its social context, for the period say twenty years from now, what are the wishes you would ask for?

These objectives of the meeting were fully met and this device appeared to be a successful method of eliciting both primary wants and many of the reasons behind them.

In greatly abbreviated form, the several wants expressed were as follows:

> Mrs. Hardy: First of all, I would like to put every child on an individual track...where every child can progress at his own rate and doesn't get held back nor does he get embarrassed by not progressing as fast as possible.... Second, a new type of motivation for for the average child. I'm not talking about the highly motivated child but the average...and my third one, and this is an odd one, is some type of job experience in conjunction with education, beginning at age 14, so that the relevance of learning to living becomes important.
>
> Professor Horowitz: I see one of the purposes of the American theory of public education (as) the development of the individual to the full extent of his capacities...and my major wish for the schools of the future would be that they perform their function. The second point that I would make, again, is quite similar to what Mrs. Hardy says but rather than wanting children to have the work experience as part of the educational process because of what it would mean to those individuals, and perhaps seem a reason for what they are going through, I would like very much to see some kind of community service become a part of the compelled activities that children up to the age of 18 must go through; something like a Peace Corps spirit would become part of the education of every child before he is done with his compulsory requirements as imposed by the state.

Father Casassa: My first wish is very similar to the first of Mrs. Hardy and Mr. Horowitz. The student should be permitted and required to move as quickly as possible; quickly not only in terms of intellectual growth, but also in sociological and psychological terms.... The second is, I think, perhaps simply a means or a partial means toward the fulfillment of the first; that is, the development of adequate testing, academically and psychologically, sociologically, and so on, so that we can put our finger on where the child is at any given point in various areas. The third...is an adequate system of compensatory education, on all the academic levels--not merely in the elementary schools--but through higher education.

Mr. Boynton: Number one: the development of a State Master Plan for the fiscal and administrative operations of public education.... Number two: effective career guidance in order to minimize waste of human talent and interests. Number three: change in emphasis of the academic assembly line K through Ph.D. so education is custom tailored to provide the individual with the means to make a contribution to the economic life of the community in a meaningful way, and thereby to be rewarded adequately.

Dr. Robinson: My three very much overlap the others.... I think it is extremely important that we reevaluate the concept and measurement of achievement.... Second point I think is related to what Hal (Horowitz) mentioned. I am very concerned, viewing my own children plus others, I detect a lack of what I would call social purpose in the broadest sense and this involves specifically an element such as community service.... Third and quite related to it..., I find a real lack of understanding and appreciation of perhaps, the non-technical aspects of our world--culture and art. I'm worried as one who's involved in the new technologies, I think we worry that my kids are going to be so subsumed in this, so subsumed in the economic objectives that we are overlooking some deep value questions.

As a direct outcome of this meeting, the following two papers discussing educational policy, wants and issues were prepared:

- "A Lawyers View" by Professor Horowitz, published as Appendix I of this report.
- "A Brief Comment on Educational Policy" by Dr. Silberman, published as Appendix H of this report.

Both papers were expansions of the remarks made by their authors during this meeting.

ATTACHMENT B

SDC PROFESSIONALS MEETING

Place: System Development Corporation Conference Room, Santa Monica

Time: 2:00 P.M. to 5:00 P.M., October 20, 1967

Attendees: (Figure 2)

SDC Operating Divisions

Dr. William H. Blanchard	-	Manpower Utilization Projects
Dr. John M. Daily	-	Training and Evaluation Group
Charles Fanwick	-	Plans and Programs Staff
Gerald Newmark	-	Education and Training Staff
Dr. Harold Sackman	-	Programming Systems Staff
Corol B. Bok	-	Plans and Programs Staff
Donald P. Estavan	-	Education and Training Staff
Dr. Ezra W. Geddes	-	Personnel Subsystem Support Group
Millard H. Perstein	-	Programming Technology Staff

EPRSC Staff and Consultants

Charles Carey - SDC Consultant

Dr. John F. O'Toole, Jr.
EPRSC Associate Director and
Meeting Chairman

Dr. Zivia Wurtele - SDC
Consultant

Dr. Olaf Helmer - SDC Consultant

Thorington B. Robertson - EPRSC Staff

Dr. Perry E. Rosove - EPRSC Staff

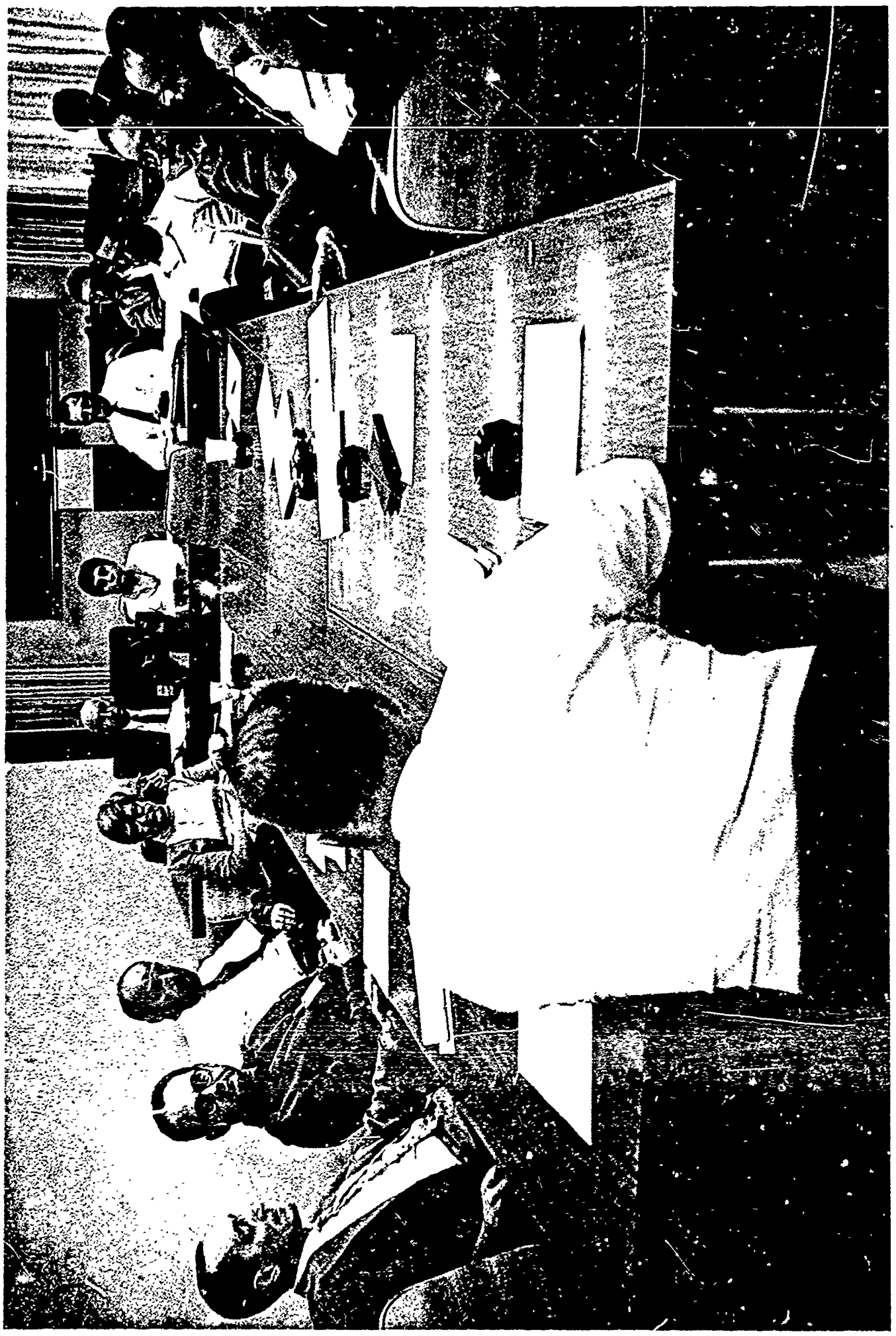


FIGURE 2. SDC PROFESSIONAL MEETING

The representatives from the SDC Operating Divisions included an educator, an engineer, four psychologists, a sociologist, a journalist, and a computer specialist mathematician.

This meeting was highly structured. It was planned as an experiment in the application of a Delphi-like technique which had been developed by the Center in collaboration with Dr. Olaf Helmer of the RAND Corporation. The discussion revolved around eight, preselected educational issues (Figure 3), considered as of the present, and as of two alternative worlds of twenty-five years hence. The primary purpose of the experiment was to measure changes in wants which might occur as the result of either debate among the participants or the introduction of alternative concepts of the future.

The three parts of the meeting and the steps followed in each part are diagrammed in Figure 4. At the beginning of each part, each participant voted his opinion on each of the eight preselected issues. Summary results were then displayed. After a review of these results, a discussion and debate of the issues was held. Each participant then voted again on the same issues and the results were again displayed.

The questions which it was hoped to answer were:

- Having expressed an opinion, will individual attendees change their vote (wants) as a result of an open debate of the issues?

- Will the individuals change their vote (wants) to suit changes assumed to have taken place in world and U.S. conditions during the next twenty-five years?

- Will a convergence of views take place as a result of the discussion similar to that which usually occurs during a series of Delphi rounds in which expert authorities are participants?

The issues embodied in the eight statements were derived in part from a review of the literature, in part from questions asked by EPRSC staff members, and in part from ongoing work of the Center. Although they were developed independently, it was found that seven of the eight issues had also been developed on the contextual map discussed in Appendix B.

29 February 1968 TM-3645/004/00

Round [ ] Name [ ] Number [ ]

EDUCATION FOR THE FUTURE

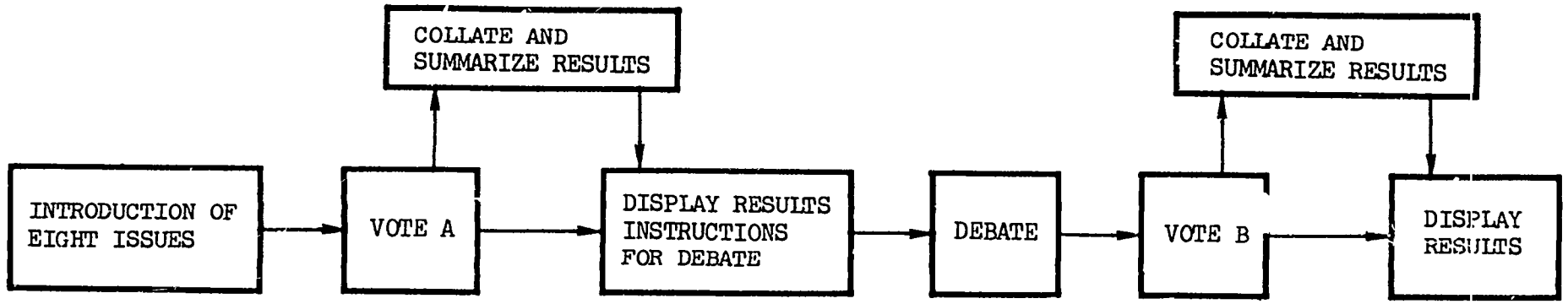
The following 8 statements are suggested for improvement of the educational system in the United States. Consider each statement in turn, and express your opinion on it by writing a number from -2 to +2.

-2 means "strongly opposed"
-1 means "no strong opinion, but on the whole mildly opposed"
0 means "no opinion" or "indifferent"
+1 means "no strong opinion, but on the whole mildly in favor"
+2 means "strongly in favor"

1.	Teachers should have a major voice in policy making regarding educational content and method.	
2.	Local control of education is no longer appropriate for a rapidly changing, complex society, therefore local school boards should give way to regional, consolidated boards.	
3.	The role of the teacher in the future should be more a guide or coordinator of learning resources than a disseminator of information to students.	
4.	Students in high school and college should have the opportunity to influence decisions concerning educational content and method.	
5.	The current educational system of public and non-public schools is divisive and should be eliminated.	
6.	Education should place greater emphasis on students learning how to think, and how to learn, rather than on the mere acquisition of information, since a rapidly chenging technological society demands it.	
7.	Communities should rely more heavily on the local school system as a central agency to link health and welfare programs, retraining programs, anti-delinquency youth programs, etc.	
8.	Life-long education should be supported by public funding of educational leaves from work.	

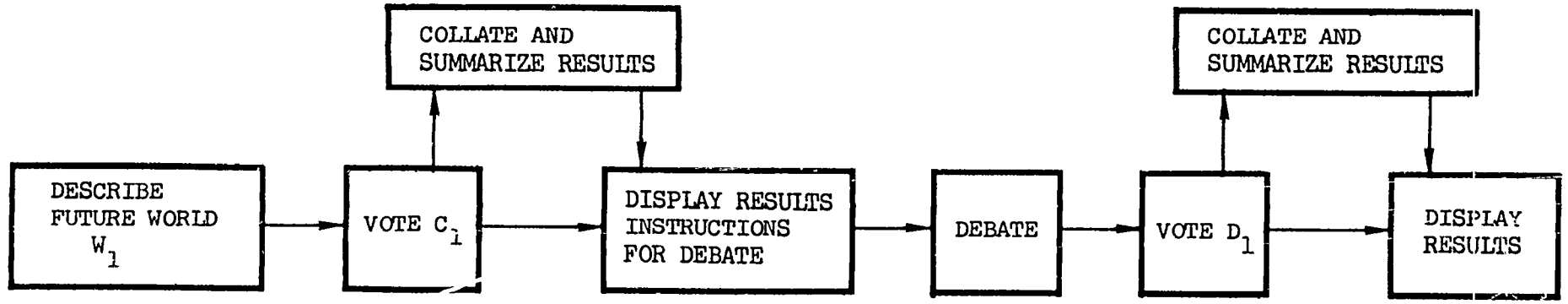
FIGURE 3. VOTING SHEET

PART I 2:00 to 3:45 P.M.



INTERMISSION

PART II 3:50 to 4:30 P.M.



PART III 4:30 to 5:00 P.M.

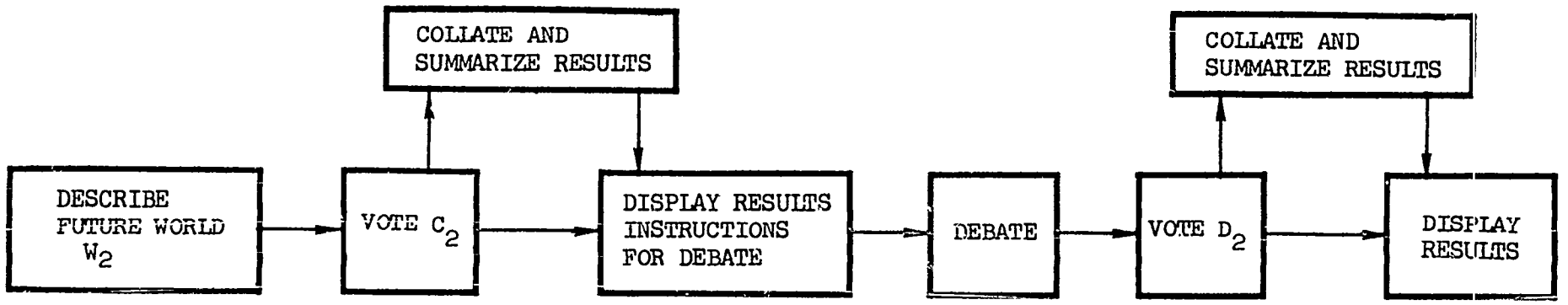


FIGURE 4. STRUCTURE OF MEETING WITH SDC PROFESSIONALS

The alternative future worlds which were presented in Parts II and III were outlined by Dr. Helmer in the following terms:

TWO POSSIBLE WORLDS OF THE YEAR 1992

The state of the world 25 years from now is here described in terms of developments along six major dimensions, namely:

- International tension
- Technology
- Urbanization
- Minorities
- Employment
- Income distribution

Along each of these dimensions we may envisage an entire continuum of possible alternatives. However, leaving extreme possibilities aside, we may describe each dimension in terms of two points on the scale, one corresponding to a conservative extrapolation of present trends (with bad things getting slightly worse and good things getting slightly better), the other corresponding to somewhat more spectacular (though not unreasonably so) developments away from present trends.

	Conservative	Non-Conservative
International tension:	Continued tension Heavy defense expenditures Occasional small wars Aggravated disparity between developed and developing nations	Considerably reduced tension Greatly reduced defense expenditures No war International effort toward world development
Technology:	Essentially no new sources of energy or food	New sources of energy
Urbanization:	Continued urbanization Pollution problems persist	Trend away from urbanization
Minorities:	Minorities problem persist	Minorities problem attenuated

Employment:	Work week reduced Retirement age moved down Some noticeable unemployment	Work week not reduced Retirement age moved up Full employment
Income distribution:	Improvements in social security, but no guaranteed annual income Disparity between incomes essentially unchanged Poverty alleviated but not eliminated	Guaranteed annual income Disparity between incomes diminished Poverty essentially eliminated

In terms of these two points on each of the six scales, one could construct 2^6, or 64, distinct states of the world as of 1992. For the present purpose, we may restrict ourselves to the two extreme cases, obtained by choosing in each case the conservative alternative or choosing in each case the non-conservative alternative.

In summarizing the results of each vote for the information of the attendees, the median vote was used (Figure 5). The chairman was provided with a tally sheet which showed the vote entered by each participant. This permitted him to know the voting range and thus to limit discussion of items on which there was substantial agreement in favor of items where the differences of opinion were marked.

It will be noticed on Figure 5 that the change of the median score from the first to the second voting round of each part and from one part to another was in most cases, not particularly noteworthy. It would appear from these results that there was little change of votes (wants) as the result of either the ongoing debate or the change of perspective from the present world to worlds of 1992. However, the apparent steady state was actually far less stable than these figures suggest as is shown by the following summary:

◯ indicates substantial agreement in vote — ROUND:	Present		World$_1$		World$_2$	
	A	B	C_1	D_1	C_2	D_2
1. Teachers should have a major voice in policy making regarding educational content and method.	①	①	1	①	①	①
2. Local control of education is no longer appropriate for a rapidly changing, complex society, therefore local school boards should give way to regional, consolidated boards.	1	1	1	1	1	1
3. The role of the teacher in the future should be more a guide or coordinator of learning resources than a disseminator of information to students.	①	①	①	②	②	②
4. Students in high school and college should have the opportunity to influence decisions concerning educational content and method.	1.5	②	②	2	②	②
5. The current educational system of public and non-public schools is divisive and should be eliminated.	-1	-②	-1	-1	-②	-②
6. Education should place greater emphasis on students learning how to think, and how to learn, rather than on the mere acquisition of information, since a rapidly changing technological society demands it.	1.5	②	1	②	②	②
7. Communities should rely more heavily on the local school system as a central agency to link health and welfare programs, retraining programs, anti-delinquency youth programs, etc.	0	1	1	1	0	0
8. Life-long education should be supported by public funding of educational leaves from work.	①	②	②	①	1	①

FIGURE 5. SUMMARY OF VOTING (MEDIANS)

RESULT OF DEBATE

	Part I Present	Part II World$_1$	Part III World$_2$
Total Decisions Made	64	72	72
Position on wants remained unchanged after debate	45	59	61
Wants held with greater conviction	12	6	8
Wants held with less conviction	2	6	3
Opinion about wants reversed	5	--	--
Not useable	--	1	--
Changes effected by debate	29.7%	18.3%	15.3%

RESULT OF CHANGING WORLD

	Part I/II Present to World$_1$	Part II/III World$_1$ to World$_2$
Total Decisions Made	72	72
Position on wants remained as in last vote in previous world	53	50
Position on wants changed from last vote in previous world	19	21
Not useable	--	1
Changes effected by changing world	26.1%	29.6%

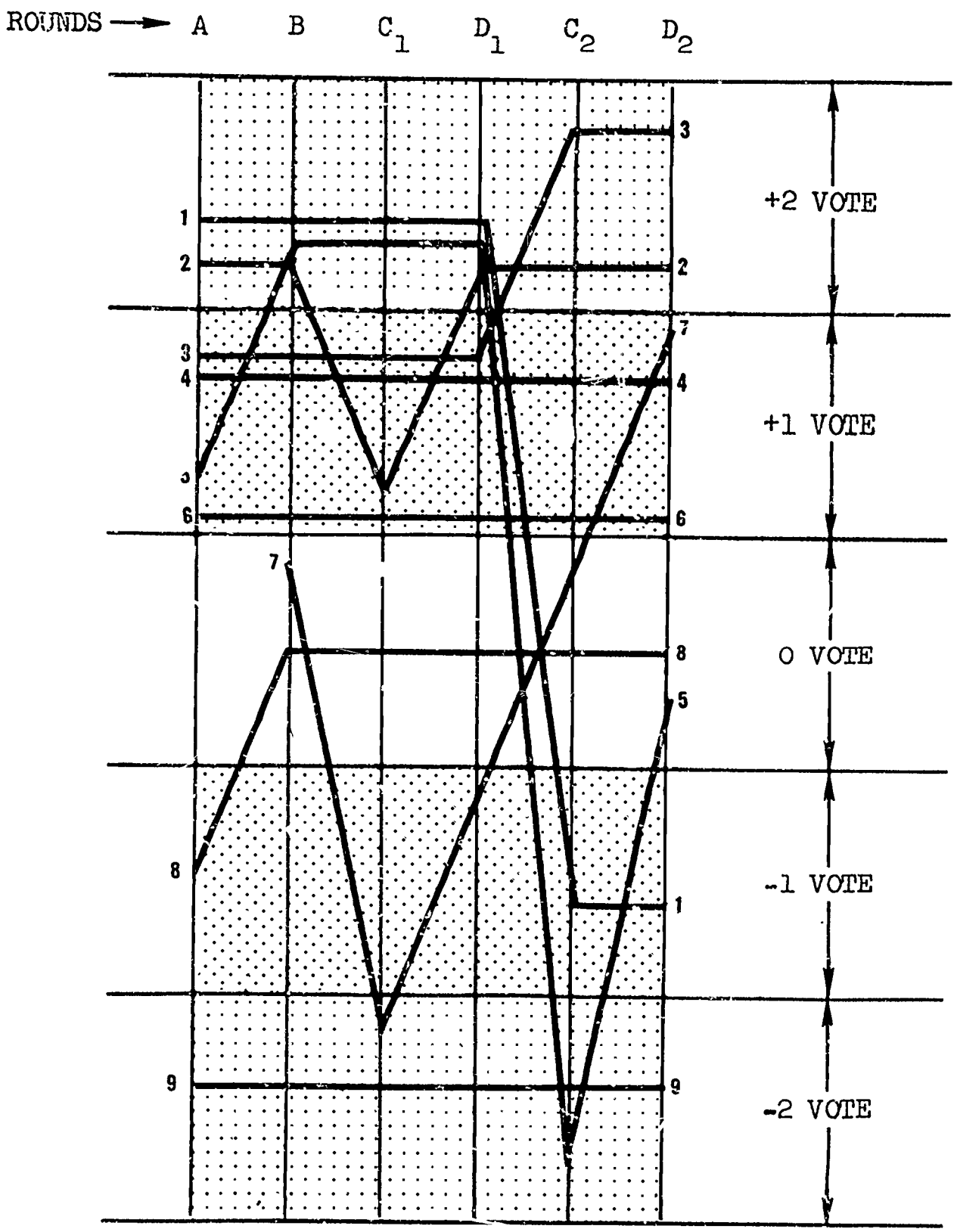
An even closer look at the voting record shows that in some cases, individuals made dramatic changes in position from vote to vote. On item 2, for example, the median in all of the six votes was "1" (Figure 5). When the votes of each participant are shown in diagrammatic form as in Figure 6, it is apparent that the summary did not disclose the substantial movement which actually took place during the course of the meeting.

The results of the meeting from the standpoint of methodology suggest that the technique used did not produce the results hoped for because of the following reasons:

- The participants were not expert in fields of knowledge which combine education and the future. They came to the discussion "cold."
- The discussion of various positions tended to reflect the preheld biases of the members and insufficient time was available to develop acceptable definitions and a common language.
- The greatest difficulty was experienced by the participants in visualizing the full implications for education of the world conditions briefly described to them during the meeting. The debate in Part III ($World_2$) was virtually abandoned as a result of this difficulty.

The results in terms of the three questions it was hoped to answer were:

- Individuals did change their opinions about wants as the result of open debate of the issues.
- Individuals did change their opinions about wants to suit assumed changes in the world twenty-five years from now. (It is not clear, however, what the bases for these changes were).
- No significant convergence of views took place as a result of the discussions either for the present world or for future worlds.



VOTING RECORD, ISSUE #2

Local control of education is no longer appropriate for a rapidly changing, complex society, therefore local school boards should give way to regional, consolidated boards.

FIGURE 6. EXAMPLE OF VOTING RECORD

29 February 1968

TM-3645/004/00

ATTACHMENT C

"OPERATION BOOTSTRAP" MEETING

Place: Headquarters, "Operation Bootstrap," 42nd Street and Central Avenue, Los Angeles

Time: 8:00 P.M. to 11:00 P.M., October 26, 1967

Attendees: Members of Regular Thursday Night Meetings

Black: Unskilled workers
Blue collar workers
Professionals
Black power militants
Housewives

White: UCLA and USC Students
Teachers
Housewives

SDC Personnel

Gerald Newmark, Discussion facilitator
Thorington B. Robertson, EPRSC staff

"Operation Bootstrap" is a privately financed effort which was begun following the riots in Watts. It is organized by Negroes for Negroes to improve the lot of black people in Los Angeles. Daytime activities revolve around the teaching of work skills. In addition, meetings are held every Thursday evening for the express purpose of establishing a dialogue between the black people of south central Los Angeles and the white people of the city.

The number of people taking part in these discussions may number a hundred or more. They are divided into groups which adjourn to various rooms in the headquarters building where they exchange views and debate issues under the leadership of discussion facilitators.

At the request of Gerald Newmark, of the SDC Education and Training Staff, one of these groups devoted a full evening to a discussion of the future of education. About half the group of some twenty-five people were white or oriental--students and teachers from UCLA and USC and housewives. The other half were black people from diverse walks of life.

The meeting was intentionally very loosely structured. As planned, it started with open expressions of opinion about educational requirements in the near and more distant future. As opportunity afforded, the facilitator focused the attention of the group upon as many as possible of the same preselected issues

as had been considered at the meeting of SDC professionals. At this session, however, it was not practical to use a formalized voting procedure or to introduce the future worlds described in Attachment B.

As the meeting progressed, it became very evident that the white university students had given the evening's subject very little prior thought and therefore could take no firm position on the matter of education for the future. Several of the black people, however, held strong, even impassioned, opinions which were related to their views of the entire social order as it affects the black community. They could and did take positions and appeared to be in general agreement among themselves regarding these positions. Many of the points raised by them were substantially the same as those raised at other meetings. However, they were often expressed from a standpoint which was completely different from that of the discussants in Santa Monica and New York.

Although the recording tapes have not been analyzed in detail, the following excerpts, taken at random, may serve to indicate something of this difference:

> I'm talking about young black people, I'm not talking about cats like myself, you understand, I'm talking about young black people who are saying: " I would rather <u>die</u> than be forced to live like my father and his father."

*** *** ***

> I think that the black people have a unique situation in this society and I think that it is the responsibility of this society to replace that which they have robbed black people of. I am saying that we are living in a society that has taught us to hate ourselves. Now this doesn't happen you understand, that black people hate themselves, somebody had to teach them that, you understand, and I'm saying that the educational system did this.

*** *** ***

> The tragedy of the educational system is that its function is to serve the vested interest of the establishment. Because I think--and it's obvious to me that the institutions should turn out qualified technicians. To turn out, to train rather than to educate, training individuals to become qualified technicians to meet those ends which the vested interests have recognized as the kind of skills that need to be met. I mean, and here again it's a matter,--it's programmatic--to turn out a whole human being. This is an individual who has the capacity to make choices, to have alternatives, he has a viable identity. And I don't think the educational institution does this.

*** *** ***

Well don't you think that the system as we know it in the establishment had to train people like that if they want to function on the level of an industrial state? They don't have time. Take the engineer, he hasn't time to learn all these other things he's going to be--the system an engineer. This is the whole system.

That's just the point, that's the point. That's what I'm saying, if one accepts the principle that the function of the individual is to serve the system--that is the way to do it. But I don't happen to believe that that is the function of people, of individuals, in a society.

*** *** ***

What I'm suggesting to you is, and it's related to this kind of a situation, that same argument has been advanced in regard to the fact that, I mean, you take the city of Chicago. They don't have no Negro window washers there. Because then those cats make too much bread washing windows there. They ain't got a single nigger in Chicago washing windows but they have some brain surgeons who are black in Chicago. And I'm suggesting to you that in that it is desirable in the black community that figures of authority be black figures simply because so that this little black child can identify. You see I'm suggesting to you that under a system that robs a black child of dignity from the time he is six years old--he sees all of the flunkies are black, you know, understand, all the Indians are black and all the chiefs are white--how in the hell is he going to believe that he can compete on an equal level? He will begin to believe, well niggers must just cain't do this kind of job...

*** *** ***

The fact is one has to recognize that within thirty-five years in this society two percent of the population will produce the goods and services for the other ninety-eight percent. So if you are going to, what we're saying then, if you are going to have the kind of competition in our educational system that produces skilled technicians, you understand, and only two percent, this is going to be highly competitive. So it would be valueless, you understand, in a society where you need only two percent skilled technicians, you understand, to go around trying to make technicians out of everybody. What the hell they going to do? What are they going to do? I mean, you see, if we are thinking about today that might hold true, but I can't stricture my thinking to just today. I've got to think about what is going to happen tomorrow.

*** *** ***

No, I didn't say we're neglecting--I say that we are not changing our educational system to meet the changing times. Six years ago when they said we needed to educate engineers, the whole American structure changed to train engineers. They could change didn't they? They did. If they wanted to change now to accommodate the minorities they could do it. They don't want to do it. So we have to look at what they want to do. Now if they wanted to change...so that they could bring up the minorities, or those people who are, what will we say, educationally disadvantaged, for one reason or something like that, they could do it. There's no hard problem for us to come up.

*** *** ***

You see I think that this, like most of the questions that are brought forth in this area--it really goes back to the roots of the system. You see, if you have, if you have a system, you understand, that puts a premium upon conspicuous consumption, material acquisition, and you use as a vehicle, you know, the educational system to achieve these material gains, it will lead you to certainly understand just what is said about the teacher being reluctant to impose controversial views upon somebody who's got the ability to deny him those material rewards. So I think that regardless of where you take this discussion to, that, at its roots, it is the whole goddam system. That's where the foulness, that's where the immorality, that's where the degeneracy, and that's where the corruptness is. And you can talk all around it, but baby that's where you've got to get back to, is the roots. The system is corrupt, you see. And until you revise it from the roots up. And you cannot take a little branch and you're going to make this little branch blossom if the roots are dead.

*** *** ***

What I think is that you're just bullshitting and wasting time because, basically, you have to start at the problem from where the problem exists. And the problem doesn't exist with the teachers. The teacher is a saw-off of the educational system in the country. Now if you're going to talk about changing the educational system in America, you're going to have to start off at the top. Because, now the teacher (as I've said already before), has a vested interest in society. So now you have to change the teacher. He's not going to be able to have free thoughts. In fact, when you live in a police state you can't talk about what you're going to institute in that teaching--, what curriculum you're going to institute--because this is already set up for you. So now what we're talking about, or what we want to teach in our schools and so forth, is set up at the top. You have to go directly to your federal government. These are the places that this policy, this system is set up to work on.

*** *** ***

Well now I happen to believe in revolution. Do you understand what I'm saying to you? This is exactly what I'm saying. This is what I'm saying to you. And indeed I can't do it now, but I hope that I live to see the day that I'll show you exactly what I'm talking about: uprooting the system and quit playing games, you understand? But before that happens, you have to develop people that are willing to die and that is what this society has not developed yet, people who are willing to die. Because nobody is going to give it to you baby, and there is a whole lot of folks that are going to have to die before you take it. Now when it gets so bad that enough people feel like, well this is bad enough (interruption). We haven't got there yet. Hopefully, hopefully, you see we're on the way. We are developing some people, Dr. Levi, we are developing some people like Levi, who say: "To hell with it, I would rather die." We are developing people like Mohammad Ali, who say: "To hell with it, I would rather die," you understand, and this is what I'm saying. When we have developed large numbers of people <u>then</u> and <u>only</u> then can you uproot the system, and all that other stuff is an exercise in futility.

*** *** ***

29 February 1968 TM-3645/004/00

ATTACHMENT D

NEW SCHOOL FOR SOCIAL RESEARCH MEETING

Place: The New School for Social Research, 66 West Twelfth Street, New York City

Time: 9:00 A.M. to 6:00 P.M., October 28, 1967

Attendees:

George Arnstein
Deputy Director
President's Council on Youth Opportunity

Peter Bailey
Jet Magazine

William Birenbaum
Educator

F. M. Esfandiary
Iranian Writer

Roger Harrison
Consultant

Phil Klass
Professor, State University College, Pennsylvania

Donald F. Klein, M.D.
Director of Psychiatric Research
Hillside Hospital

Sara Mitchell Pryor
New Yorker Magazine

John F. O'Toole, Jr.
Associate Director, EPRSC
System Development Corporation

Robert Rivera
Real Great Society

Ron Silverman
Director, Dartmouth Experimental College

Alvin Toffler
Writer - Meeting Chairman

Phil Werdell
American Council on Education

This meeting was held under the joint sponsorship of SDC and the New School for Social Research. It was arranged for and chaired by Alvin Toffler. Those attending included three educators, a journalist, a psychiatrist, a psychologist, three writers who are futurists, a writer-educator, a student/experimental college president, a representative of a self-help organization, and a consultant to the American Council on Education.

The original plan was to structure this meeting along lines similar to those described in Attachment B but to start the discussion with a request for three wishes for education as was done at the meeting described in Attachment A.

The three wishes were, in this case, written down by the participants on a form provided, at the beginning of the morning session. At the discretion of the chairman, however, the plan for formal rounds of voting was abandoned. Two of the discusssants were black people and it turned out that much of the time available was devoted to discussing black minority problems. It is evident from the recording tapes that the longer time (nine hours) allowed the participants at this meeting permitted a much greater development of ideas and reasoned argument than was the case at the three shorter meetings, and thereby provided a richer body of material for later analysis.

A week following this meeting, two of the participants sent the Center written summaries of their impressions. One was from Sara Mitchell Pryor, who had this to say:

> Being included in the SDC-New School conference last Saturday was an encouraging and stimulating experience for me. I share your feelings that a great deal was accomplished and should like very much to participate when future meetings are scheduled....
>
> I was somewhat embarrassed and unnerved - yet remain hopeful that the focusing of the discussion on problems peculiar to communities represented (so determinedly) by Peter Bailey and myself did not hinder altogether the plan and progress of the meeting. Since the time was short, we felt pressed to expound our special needs in order that they would not get lost among the grand problems of the majority as they often have in the past. Having been received with intelligence and tolerance, but without condescension, hopefully, we should be more relaxed next time.
>
> I am proud of having attended the conference and look forward to talking with you more in the future.

The other letter, by Alvin Toffler, summarized the accomplishments of the meeting and the principal views of the participants s follows:

> The October 28th meeting sponsored jointly by SDC and the New School for Social Research brought together a high powered and heterogeneous group. Members of the group ranged from professional educators to journalists, psychologists, psychiatrists, poverty workers, black power advocates, a science fiction writer, a student leader of the Dartmouth Experimental College, and a number of others. Criteria for selection included: 1) an interest in education; 2) intelligence; 3) interest in the future; and 4) originality of views. Whatever else might be said, this was not the common, garden variety meeting on education. Most of those present did not know one another in advance of the meeting. The original plan to keep the number below twelve fell by the wayside; the final number was, I believe, fifteen. With a single exception, every invitee showed up.

Since you have taped transcripts of the meeting, I will make no attempt to provide a comprehensive summary, but will rather make a number of comments about the session. I will also outline the chairman's objectives.

As one who has systematically investigated the "futurist" profession both here in the United States and Western Europe, I have been struck by the narrow spectrum of talents tapped by those interested in studying the future. With only a few exceptions, the leading futurists in the U.S. and Europe are white, middle or upper class, well educated, and over the age of forty. I therefore responded enthusiastically to SDC's suggestion that a panel be brought together which would represent far wider interests than those normally examined by those analyzing or planning for the future of education.

From this position flowed a decision to conduct the meeting in such a way that all would participate and that no group or individual would choose to "cop out." This decision led, ultimately to a heavy emphasis in the meeting on problems of race and education. An essentially "black power" position was forcefully presented throughout the day by two of the participants. The heavy emphasis on this issue led to inadequate discussion of certain other issues the participants indicated an interest in.

Nevertheless, even within this framework a number of rich and insightful points were made. It is clear that one of the issues that deeply troubled the group was the issue of diversity in education. The black power people spoke in terms of providing "black" schools that would offer an alternative to the white mainstream schools of society. Others spoke of reorganizing education in such a way as to provide maximum freedom and variety for the individual student. Though others may have interpreted the discussion differently, I drew the conclusion that a far deeper analysis is needed of the degree of diversity that an educational system should provide. Nobody favors the "lock-step" system that still dominates today and much of the discussion is couched in anti-lock-step rhetoric. At the same time, it is clear, at least to me, that an educational system that offered something different for everybody without at the same time making certain across-the-board offerings might serve the individual at the expense of a properly integrated social structure. Education is one of the primary forces tending to integrate a society. The long overdue movement away from standardization needs to be encouraged. But it is important to bear in mind the need for socializing as well as individualizing experiences in education.

As the discussion wore on, it appeared to me that the positions in the room could be ranged across two axes. One of these was the now-then axis with some of the participants either unable or unwilling to cut loose from the present for a free flowing discussion of the next generation. Although the time frame proposed for the meeting was the next twenty to thirty years, some discussion was devoted to possible futures much further down the pike. In future discussions it will be useful to maintain a sharper "fix" on the appropriate time horizon. This may, perhaps, be done by the presentation of alternative "worlds" as reference points.

The other, and more interesting axis was what I call the economic-psychological. To put the matter crudely, the room seemed to be divided between those who demand of education that it provide concrete, practical skills and values that would prepare members of under-privileged population groups to take their place in the affluent society. Those in the room who were associated with the civil rights movement, the poverty program, and other social action agencies seems, in effect, to be saying, "give our people a practical, job-oriented education. Only if this is done can they become fully participating members of American society. Failure to do so not only affects their occupational future but necessarily affects their values as well."

At the same time, there were in the room those who take a sharply different view of the purposes of education. This group looks to education to improve "interpersonal relationships," to make people more sensitive to one another, to make them more aware of "non-cognitive" aspects of life. Some of the members of this group refer to any education that is job-oriented or, indeed, data-oriented as "mere training." The assumption appears to be that "cognitive" education will somehow take care of itself. They appear not very interested in the problems of finding better ways to create intelligent, analytic, and rational citizens. In fact, an almost unvoiced premise of their position appears to me to be the belief that a fundamental contradiction exists between rationalism and humaneness.

There is no clear-cut line between these two groups. Both make use of each others rhetoric. No one defined the issue in these terms. Nonetheless, it appears to me that the group at our meeting was making two very different sets of demands on the educational system. Serious damage may be done to the educational system in this country if this split is allowed to widen. My own fear is that those who are primarily interested in "affective" education may throw the "cognitive" baby out with the lock-step bathwater.

It is clear that the issues raised at the meeting need much further and deeper discussion. In some sense, the meeting must be regarded as no more than a shakedown cruise. The participants were getting to know one another as individuals. I am greatly encouraged that most of the participants expressed to me privately their own desire for follow-up sessions. A number of them suggested that much territory had been covered that would not need to be covered again. This comment from among others the black power advocates, gives hope that subsequent meetings will be even richer and, perhaps, more useful. I believe we have something going here that should not be allowed to die. I therefore suggest that a follow-up meeting be planned for sometime in the near future to take advantage of the thrust generated so far.

AN ANALYSIS OF POSSIBLE FUTURE ROLES OF EDUCATORS AS DERIVED FROM A CONTEXTUAL MAP

by

Perry E. Rosove

APPENDIX E

TABLE OF CONTENTS

I. INTRODUCTION

A. The Problem

In a world increasingly characterized by change, the policy maker in education is forced to anticipate the future. Strong leadership can be provided in education, as in other fields, only if there are desired futures to guide the policy decision process. In the absence of such futures--a set of concepts which provides a framework for thinking about and planning for the future--education may evolve haphazardly, or under the domination of technological or other incidental values (26).

The problem of anticipating the future is especially difficult for educators. Policy makers in noneducational areas may be required to plan for a future that extends five years, or perhaps ten years, ahead. But in education, decisions must be made today for a future that is a generation away. A child starting in school this year (1968) will be 26 years old in 1988, in the prime of his adult life. Will the education he will receive during the next fifteen years prepare him adequately for a lifetime of work and self-fulfillment? How relevant is today's education for life in the 1980's and beyond? Do today's educators carry out their daily tasks with that future in mind? Should their roles be changed in anticipation of that future?

This report describes an investigation into the possible roles of educators in a period beginning approximately twenty years in the future. The roles of educators are selected for investigation because they are central both to the learning process and to education as an institution. The key generic role concept today in education is, of course, the "teacher." This concept, with all its traditional connotations, provides a handy conceptual hook on which are hung a set of presuppositions about the objectives of education, the nature of the learning process, and the organization of learning environments ("schools"). This investigation will be concerned with the future of educators in general, but we shall focus for detailed analysis on the central concept of the "teacher."

The selection of the roles of educators, and particularly the role of the teacher, as the substantive area for study in the context of the future leads logically to two additional steps. To understand and conceptualize the possible roles of educators as they might exist in 1988, we must conjecture about the learning environment in which those roles would be embedded. And to understand what the possible learning environment may be like twenty years from now, one must have some comprehension of the possible characteristics of the society in which the learning environment will play a rational and coherent part.

B. Applicability of Available Forecasting Methods

The investigation of future possible roles of educators and of learning environments and society in the late 1980's leads directly to the question of the applicability of available forecasting methods. Previous work was devoted to a survey of forecasting methods which might be relevant to the substantive problem described above. In a report published in August, 1967, twenty-one methods used in the study of the future by other investigators were identified, defined, and evaluated. A second report published in November, 1967 described the structure and content of a half-completed "contextual map," one of the twenty-one methods previously evaluated. In that report we defined "contextual mapping" as a graphic display of the logical and causal dependencies of functionally related phenomena. This second report also provided the rationale for the choice of contextual mapping as an experiment in the investigation of the possible future roles of educators. It discussed the advantages of contextual mapping as a method for conjecturing about the future in a public context.

The purpose of this current report is to present the "complete" results of the "experiment" in the use of contextual mapping (see Attachment A). These two terms in quotation marks require some explanation.

The contextual map presented in this report is complete only in the sense that the available time and resources allotted to the task have been exhausted. A contextual map is a dynamic resource for open debate and discussion which should be constantly modified and updated as new, relevant data are obtained. Trend statements are never static or fixed or complete, but always subject to change either in terms of content or of location on the map based on additional trend analyses and social, economic, and other theory which may be relevant. A contextual map is not a factual representation of the future since there are no such facts. It consists, rather, of a set of hypotheses about extrapolated trends and the relationships among those trends, and as with all other hypotheses, they are subject to constant revision. Furthermore, since the hypotheses pertain to future events, processes, and conditions, the rate of revision may be much more rapid than is the case in traditional social science.

The state of the forecasting art is very primitive at present. It is particularly primitive in the social area by contrast with "technological forecasting" or the forecasting of technological developments (2). It should be recognized, then, that any effort to conjecture at this time about the future of social affairs, including educational matters, is inevitably a form of experiment.

The contextual map described in this report should be regarded as a first step in the effort to apply a particular method for conjecturing

about the future in the social realm. The method has limitations and these are discussed in section IV. However, we regard this initial effort as highly successful and worthy of further research and development.

The reader who is more interested in the major conclusions of this investigation than in the methodological issues may turn directly to section V, E.

II. METHOD

To accomplish the objectives of this investigation, at least three steps were necessary: (A) a survey of the literature on forecasting methods; (B) the evaluation, selection, and application of one or more methods for conjecturing about the possible future roles of educators; and (C) a survey of the literature dealing with future roles of educators published by other researchers or educators.

A. Survey of Forecasting Methods

The results of the survey of the literature on forecasting methods have already been published (see Appendix A). A major outcome of the survey was the decision to explore the future roles of educators by constructing a contextual map.

B. Application of a Forecasting Method

The idea that the method of contextual mapping would be a very useful approach, with many long-range potentials, emerged first out of the review of this method by Erich Jantsch, and his comments about its potential utility (18). Jantsch's closing remarks about contextual mapping are worth quoting here:

> "This aspect of exploratory forecasting seems to have been applied very successfully. In the absence of systematic large-scale normative forecasting in areas other than advanced technical development, contextual mapping has not yet received the full attention which it deserves. It is considered of potential value within the framework of social technology."

The decision to make use of a contextual map as a device for coming to grips with the substantive problems of social trends, the future of education, and the possible roles of educators in the late 1980's was reached as we acquired sufficient knowledge of the state of the forecasting art, as we read the literature dealing with social trends, and as we attempted to cope with a basic issue--how to use forecasting tools in the context of a public debate (9, 21).

An explanation of the structure, and a description of the partially completed content of the contextual map prepared for this investigation appeared in a previously published report (see Appendix B). For the benefit of readers who do not have access to that document, we repeat below some relevant sections. These sections are in quotes and indented to facilitate identification. Attachment A of this report is the first published version of the complete contents of the map.

1. "Map Structure

The contextual map is composed of a two-dimensional matrix containing 36 cells (see Figure 1). The vertical axis of the matrix is divided into rows, each of which represents functionally distinctive phenomena--the basic, long-term trends of Western civilization. These trends have been adapted from the work of the Hudson Institute (19). Five trends were selected since it appeared that they were particularly rich in possible implications for education. The trends are:

- Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture;
- Transitional, mass-consumption society characterized by higher GNP and personal incomes, affluence (among the better educated);
- Worldwide industrialization and modernization;
- Institutionalization of change, especially through research, development, innovation and organized diffusion;
- Accumulation of scientific and technological knowledge.

"For the sake of facilitating the mapping of functionally related phenomena, we have grouped the trends into three major "sectors" and identified a total of six subsectors as rows of the matrix: cultural, socio-cultural, economic-national, economic-international, science and technology-organization, and science and technology-information.

"Phenomena within a row are more closely related than phenomena among different rows. However, since the rows represent concepts, they should be recognized for what they are--convenient abstractions which help organize otherwise apparently disparate data. There is much overlap between and among the rows. Obviously developments which occur within the sector of science and technology affect in a

Basic, Long-term Trends	Major Sub-Trends	Social and Technical Implications	Implications for Education	Educational Functions	Possible Future Roles	Major Issues
(Cultural Sector) Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture.	1A	2A	3A	4A	5A	6A
(Socio-cultural Sector) Increasingly sensate, empirical, humanistic, pragmatic, utilitarian culture.	1B	2B	3B	4B	5B	6B
(Economic Sector-National) Transitional, mass-consumption society characterized by higher GNP and personal incomes, affluence (among better educated).	1C	2C	3C	4C	5C	6C
(Economic Sector-International) World-wide industrialization and modernization.	1D	2D	3D	4D	5D	6D
(Science & Technology Sector) (I Organization) Institutionalization of change, especially through research, development, innovation & organized diffusion.	1E	2E	3E	4E	5E	6E
(Science & Technology Sector) (II Information) Accumulation of scientific and technological knowledge.	1F	2F	3F	4F	5F	6F

FIGURE 1. AN EPRSC CONTEXTUAL MAP (ROLES)

variety of ways developments in the economic sector. Similarly, events and trends in the economic sector affect the socio-cultural sector. These interdependencies are not easy to show in a two-dimensional matrix. However, we have attempted to represent them in Attachment A by a dot-dash line.

"The horizontal axis of the matrix is divided into six columns which are designed to show the logical and causal sequences of events, trends, conditions, and processes dependent upon the basic, long-term trends. The six columns include:

- Major Subtrends
- Social and Technical Implications
- Implications for Education
- Educational Functions
- Possible Future Roles (for educators)
- Major Issues

"The selection of these column headings reflects both a logical order and the substantive concerns of the SDC Pilot Center effort, i.e., the implications of social and technical trends for society, education, and the roles of educators.

"Trends, events, conditions, and processes are represented in each cell of the matrix by "entries." Each entry is enclosed in a rectangular box. Functionally related entries are identified by the same numeral across an entire row of the map. There are a total of 18 functional areas, three in each of the six rows. Each functional area is identified by a name as well as a number. Entries which are regarded to be especially important are set off from other entries by heavy black boxes. The lines joining the entries indicate logical and causal dependencies. Time is represented by the flow of boxes from left to right. The heavier black lines linking boxes indicate alternative trend possibilities. The dashed lines suggest possible interdependencies. A dot-dash line, as we noted above, is used to show interdependencies between and among different rows of the matrix.

"Note in Attachment A that each entry is identified by a number, e.g., 5.1, 5.2, 5.3, etc. The number before the period identifies the functional area to which the entry belongs; the number after the period identifies the entry's sequence in that area. Such identifications make easy reference to each entry possible and also

provide a basis for associating an entry with other data or information available to the EPRSC such as the automated bibliographic data base, demographic computer models, and statistical data available in literature sources. At this point in time these associations are merely potentialities of this approach; they have not yet been constructed. Carrying out this development would be properly a function of the operational center. However, there are no serious technical problems involved in building such a capability.

"It should be pointed out that the actual map in use at SDC is coded in color. For example, entries are pinned to the map with red tacks to indicate they are critical; blue tape is used to show logical and causal dependencies. Attachment A shows the same structural features of the actual map but it has been changed as described above for the purposes of reproductior in black and white."

2. "Map Content

a. Application of a Method String

"The structure of the contextual map and its content are closely related. The one suggests the other, as we noted in the previous section. The extensive body of literature dealing with social and technical trends suggested the need for a systematic method, such as a contextual map, for dealing with them; and at the same time, these literature sources provide, in part, the content of the map cells. It would have been possible, of course, to generate our own time-series extrapolations and analyses of social and technical trends. But much work had already been done in these areas by others. The more practical and useful course of action was clearly to make maximum use of the extensive published material.

"In the SDC progress report cited earlier, it was pointed out that "the value of a method may be altered when it is examined, not by itself, but as one step in a logically sequenced combination or string of methods." The concept of a "method string" implies that one method or a number of methods may provide inputs to the operation of another method, such as contextual mapping, (or as time-series extrapolations and macrohistory are used at the Hudson Institute to develop scenarios) while additional methods may make use of the outputs or results of all the previous methods employed.

"The content of the contextual map described in this report is based on an application of a method string. As we noted in describing the rows of the matrix in Figure 1, the "basic, long-term trends" were derived from the work of the Hudson Institute.

The content of the intervening variables in the "Major Sub-Trends" column in Figure 1, was also derived in part from the publications of the Hudson Institute, the publications of the Commission on the Year 2000, and many other published sources which have used a variety of methods to identify major trend .

"Other methods may be used in conjunction with the contextual map either to provide supporting data or to make use of outputs of the mapping process. To illustrate, we may assume that a user of the map desires a closer examination of a particular entry in a cell. A computer model containing appropriate variables might be operated to provide requested outputs, such as annual projections of student or teacher populations. If educational objectives can be formulated through study of the contextual map, after consideration of possible alternatives, a relevance tree might be constructed to determine systematically the types of educational programs, their costs, personnel requirements, and curricula changes, etc., which would be needed to accomplish the objectives.

"All the possible combinations of method strings cannot and need not be formulated at this time. There is no limit to the range of possibilities. To explore this range will require a great deal of additional work on specific substantive problems. This should be a task of the operational centers. What is evident now, however, is that the contextual map lends itself to the combined use of a variety of other useful methods.

b. "Logical and Causal Dependencies

"At the extreme left of the foldout pages in Attachment A, are the independent variables--the basic, long-term trends of Western civilization. Proceeding to the right we derive the intervening variables--major subtrends. Up to this point we are dealing with either historical "facts" or trends which can be supported by data such as time-series extrapolations. As we proceed further to the right, we leave the realms of history and data behind and enter the realm of conjecture based largely on extrapolations of social, cultural, and technical trends and associated theoretical analyses. We begin to identify causal dependencies of the basic trends and subtrends; to make logical deductions; and to infer implications. Thus the vertical axis divides relatively accepted "knowledge" toward the left and more unreliable ideas about trends to the right. We also identify alternative possible directions of trends or sequences of developments. For example, urbanization may increase or it may decrease; the polarization of society on the basis of race and educational level may increase or decrease; centralization of power in organizations may increase or decrease; etc. The long-range implication of the mapping process is that each alternative should be explored for its consequences.

"No distinction has been made in Attachment A between the content of entries which have been taken directly from published sources and those which have been derived by the writer by logical and causal analysis of the major subtrends. No claim is made that the content of the entries and the logical and causal relationships which we have shown in Attachment A are the only possible ones or that the content shown is exhaustive. Clearly, if others had developed the map content, different entries might have been regarded as more important, the entries might have been worded in other ways, and different logical and causal dependencies might have been preferred. No argument is offered to prove or to verify that the content sequences portrayed are "true" since there are no facts about the future which can be proven or verified. They do portray reasonable and responsible conjectures about the future."

C. Survey of the Literature on Roles of Educators

This step has not been mentioned in previous reports and it was not originally regarded as necessary. One may ask, of course, what does contextual mapping reveal about the future roles of educators that other, more conventional methods do not? Is it worth the cost and effort? It was necessary to read through as much of the literature which could be found on the future roles of educators as possible in the time available in order to determine that, in fact, the method of contextual mapping contributed something unique. A comparison was made between the published literature dealing with the future roles of educators and the results of the contextual mapping process. This comparison demonstrated the unusual power of contextual mapping: the map described in this report, although it was a limited, experimental effort, contains 98 different possible future roles for educators and locates them in a logical and causal sequence of extrapolated events, processes, and conditions. No other method in the literature surveyed deals with more than several roles at a time, while most journal articles, reports, and essays, etc. deal with only one role such as "the teacher," "the guidance counselor," "the educational engineer", etc. In addition, as a by-product of the mapping process, 101 potential educational issues were identified. Other advantages of contextual mapping over more conventional methods are discussed in section IV.

III. RESULTS

A. A Contextual Map for the Roles of Educators

The results of the contextual mapping activity appear in Attachment A.

B. Possible Future Roles of Educators

For the purposes of our Pilot Center work, we have defined a "role" as a set of behavior patterns or overt activities associated with a social position. A "position" is defined as a prescribed category in a group, social system, organization, or institution, e.g., teacher, student, father, foreman, etc. These definitions suggest the importance of an organizational context for the study of roles.

An earlier report listed the possible future roles identified through the use of the contextual map up to 30 November, 1967. At that time 58 roles had been identified. Table 1 in this report presents a complete list of the roles, now numbering 98. The role titles and descriptions in Table 1 are taken directly from the column of the map labeled "Possible Future Roles," cells 5 A through 5 F of Attachment A. It should be emphasized that these role titles and descriptions are generic concepts. On the subject of generic roles we quote from our November report:

> "Some of the roles already exist in educational institutions; others have been conceived but have not yet become operational; to the best of our knowledge, others appear in our contextual map for the first time. As these generic roles, both old and new, either continue to develop or begin to develop, they will fragment into more specialized subroles. For the purposes of the SDC pilot project, we are remaining on the level of the generic role. In some cases the generic roles described in Table 1 have already received considerable detailed attention in the educational community and classes of subroles have been identified."

Since the above words were written, it has become increasingly evident that the emergence of new roles does not follow merely a process of fragmentation into more specialized subroles. A perspective of twenty years into the future suggests that while some roles may continue to fragment into subspecialties, others may be developing in the reverse direction, for example, the "teacher's" role may shift in the future toward the acquisition of new and different functions rather than toward increasing specialization. A different, composite concept of the "teacher's" role is presented in Part V, E.

The field of education at the present time is characterized by experimentation, research, and reforms in traditional organization and operations. Many of these activities and changes are concerned with the study and development of new roles for educators or modifications to existing ones. The references to "new" roles, therefore, in this report pertain to (1) those roles which are not widely used in current educational systems; (2) those roles which are not recognized as part of the formal educational system; and (3) those roles which exist only in

TABLE 1. COMPILATION OF POSSIBLE FUTURE ROLES FOR EDUCATORS FROM THE CONTEXTUAL MAP

POSSIBLE FUTURE ROLES
CELL 5 A
1) Problem formulators - those who identify and define relevant research and other types of problems for advanced learners to attack either as individuals or in groups.
2) Group leaders - those who conduct learning games, simulations, sensitivity sessions, confrontation groups, interdisciplinary learning and problem solving sessions, etc.
3) Administrators in education - those educators trained comparably to the highest levels in industry and government.
4) Simulation and gaming designers and developers - those who create various types of simulation and games used for educational purposes.
5) Simulation and gaming operators - those who run various types of educational simulations and games.
6) Professors of values - those professors whose primary concern is integration and transmission of new values.
7) Special managers and supervisors - those who manage and supervise schools for treatment and rehabilitation of school-age drug addicts.
8) Special managers and supervisors - those who manage and supervise schools for delinquents, dropouts, runaways, etc.
9) Designers of curricula and educational programs for special schools.
10) Special instructors - those teachers with unique training who work in special schools; focus is on human relations, not subject matter.
11) Special managers and supervisors - those who manage and supervise schools for pregnant students.
12) Mores coordinators - those who work with students and parents to attempt consensus regarding sex education, birth control, dress, etc.
13) Special counselors - those who advise youth on sexual behavior and problems of early marriage.
14) Group leaders - those who lead seminars and group discussions on sexual behavior, birth control, marriage and the family, venereal disease, juvenile delinquency, etc.

CELL 5 B

15) One-to-one tutors - those with special qualifications who assist in the education and guidance of unique learners at opposite ends of the spectrum - the unusually disadvantaged and the unusually gifted.

16) High performance educators - those highly qualified teachers trained specifically to facilitate learning processes among the disadvantaged in urban ghetto environments.

17) "Spanners" - those who bridge gaps between generations, administrators and students, teachers and students, higher and lower classmen, more advanced and less advanced learners, etc.

18) Uncredentialed teachers - those who have had approved college-level training adequate to provide learning environments and processes for the disadvantaged in urban ghetto environments.

19) College student assistants - those college students who will be paid minimal salaries to work in urban ghetto environments with high school level or younger students who require compensatory programs.

20) Vocational training-career spanners - those who assist vocational education students bridge the gap between education and work.

21) Supervisor/trainers - those who provide both supervision and training for young people in on-the-job learning situations.

22) Psychiatric aides - those personnel trained in psychiatry or clinical psychology who assist educators with pupils suffering from psychological obstacles to learning.

23) The educational futurist - one who systematically explores the implications of the future for educational purposes.

24) Education architects - those who design the facilities, plants, edifices, etc., in which individual, group, and community-wide educational experiences can occur.

25) Technical assistants - those who assist in the learning process by providing specialized knowledge in the use of equipment which conveys information such as audiovisual aids, filmstrips, programmed instruction, etc.

26) Goals formulators and coordinators.

27) Community representatives - those persons chosen by the local community to represent the community in meetings and conferences with local educators.

CELL 5 B (cont.)

28) Community education coordinators - those who coordinate, plan, and manage multiple and diverse educational programs serving a community in the local school or learning environment.

29) Program evaluators - those who evaluate non-formal, work-oriented, or community activities for their contributions to a student's educational goals and educational standing (accreditation).

30) Community curriculum designers - those who develop on-the-job, community action, apprenticeship, and other types of learning experiences which occur outside of formal educational institutions.

31) Credentials experts - those who have the training and official authority to translate wide varieties of work and learning experiences into formally acceptable criteria for individual progression, award of certificates, graduation, etc.

32) Master teachers - those highly qualified educators who lead teaching teams and supervise uncredentialed teachers, assistant teachers, student teachers, technical assistants, etc.

33) Student teachers - those students acquiring a baccalaureate degree with the goal of becoming professional teachers who assist the learning process under the direction of professionals. (Note: this role is not limited to a "teacher's college" - any liberal arts student would be eligible.)

CELL 5 C

34) Contracts administrators - those who manage, monitor and evaluate educational subcontracts under the management of private industry.

35) Industrial educators - those who perform the counterpart role of the professional educator in the environment of private industry or not-for-profit environments.

36) Leisure-time planners - those who plan avocational education programs.

37) Leisure-time teachers - those who provide instruction in avocational education programs.

38) Financial planners - those trained in finance and education who allocate millions of dollars for educational research, systems, programs, etc.

CELL 5 C (cont.)

39) Financial coordinators - those educators trained in finance who have the responsibility to work out educational financing with financial representatives at appropriate public levels such as the community, city, state, etc.

40) Financial managers - those educators professionally trained in finance who serve as staff members to educational administrators at all educational levels and in all types of communities.

41) Educational modelers - those educators responsible for developing mathematical models of the total educational system.

42) Cultural quality educators - those educators responsible for determining the criteria of "cultural quality" for relevance to development of pertinent educational programs.

43) Human resources planners - those who design educational programs to maximize the human capital of the nation in line with national goals.

44) Educational data archivists - (1) those archivists who determine which data should be collected; (2) those archivists who collect the data; (3) those archivists who maintain the data archives and retrieve the data on request.

45) Cultural quality planners - those who design educational programs for maximum cultural quality.

CELL 5 D

46) System designers - those who design and develop man-job/task matching, computerized systems.

47) Multilingual educational administrators and managers who will act as advisors to their counterparts in foreign cultures.

48) Education/job/task consultants - those who assist learners at all levels and in all aspects of the educational network to bridge the gap between learning phases and job/task phases.

49) Long-range planners familiar with systems analysis, mathematical models, and use of computers.

50) Tour leaders - those who plan tours and lead learners at all educational levels in visits to field sites (worldwide) relevant to various learning purposes.

CELL 5 D (cont.)

51) Transportation managers - those who design and operate the transportation networks linking people, facilities, and places in the learning process.

52) Designers and maintainers of universal language machines.

53) Multilingual translators (human beings).

54) Multilingual group discussion and seminar leaders.

55) Cross cultural educators - those educators from elementary to university levels capable of participating in learning processes with pupils from foreign cultures, with different languages, and widely varying interests and backgrounds.

56) World professors - those educators and professionals of outstanding repute who serve no single institution but who provide regular inputs to world-wide educational dissemination networks.

57) Grants monitors - those who select, monitor, and evaluate educators conducting research, teaching, counseling and guidance on non-local or distributed university or college level assignments.

58) Grants planners - those who plan needed professorial services worldwide and who administer necessary funding.

CELL 5 E

59) Futurists - those who systematically study the future on a full-time basis.

60) The change agent - those responsible in educational institutions for the introduction of innovations.

61) Translators or interlocutors - those who bridge the gap between scientists and non-scientists with a need to know such as legislators, managers, teachers, administrators, and the public.

62) Demonstration educators - those teachers who demonstrate the use of new teaching methods and new subject matter to other educators.

63) Curricula planners and maintainers - those who plan for changes in curricula and the development of new curricula in accordance with developments in science and the shifting content of occupations.

CELL 5 E (cont.)

64) Counselors for educators - those who provide guidance regarding educators' needs for in-service training and reeducation.

65) Science and technology educators - those who provide training in current knowledge for in-service teachers.

66) Curricula schedulers - those who delete obsolete curricula and introduce new curricula into the educational system.

67) Science and technology advisors - those scientists and technologists who provide guidance for in service teachers on the need for new knowledge acquisition.

68) Vocational education planners - those responsible to plan for and to modify vocational education curricula in accordance with changing job patterns and emergence of new types of careers.

69) Counselors for non-educators - those who provide guidance to working adults regarding needs for retraining and reeducation.

70) System operators - those who operate computerized man-job matching systems.

71) Educational psychopharmacologists - those who administer drugs to facilitate the learning process.

72) Talent identifiers - those who identify and counsel highly gifted learners for educational programs at the elite level.

73) Symbol use designers - those who design individualized types of instruction in area of symbol manipulation.

74) Symbol use educators - those who provide expert instruction in symbol manipulation.

CELL 5 F

75) National educational planners and coordinators - those who plan and coordinate educational services for multiple users at local levels.

76) Coordinators of local, state, and national planning regarding linking of educational institutions and systems networks.

CELL 5 F (cont.)

77) Communications managers - those who design and operate the communications networks linking people, facilities, and places in the learning process.

78) National educators - those who create and operate nationally sponsored educational programs.

79) National education evaluators - those who develop evaluation criteria for local educational systems and individuals.

80) Information scientists - those who serve as specialized staff assistants at all levels of educational administration.

81) Information system and data base designers - those who create the computer-based libraries, memory banks, data bases, data retrieval systems.

82) Electronics experts - those who install, operate, and maintain electronic equipment in education.

83) Abstractors and indexors - those who monitor professional and scientific journals and publications for appropriate updating of data/model/computer program bases.

84) Library managers and operators - those who manage and operate computer-based library network and data retrieval systems.

85) Long-range planners - those who systematically interpret the work of educational futurists into plans with a 20 year time span.

86) Short-term planners - those who systematically translate long-range plans into educational programs with a 10 year time span.

87) Educational administrators - those who systematically translate 10 year plans into operational plans.

88) Managers - those who manage the facilities producing materials for educational purposes, both hardware and software.

89) Credentials evaluators - those who certify creators of special educational media: T.V., films, tapes, etc.

90) Special curricula designers - those who prepare subject matter in the form appropriate for media such as computer programmed instruction, T.V., etc.

91) Computer programmers - those who translate basic curricula into programs for computer-assisted instruction (CAI).

CELL 5 F (cont.)

92) Acceleration instructors - those who use special techniques to accelerate learning rates.

93) Instructors for infants - those who provide instruction for the one to five year old age group.

94) Psychopharmacologists - those who administer the use of drugs in education.

95) New philosophers of education - those philosophers who accomplish a rapprochement between humanism and the new technology of education.

96) Information system specialists - those who train educators in use of information system technology.

97) Information system educators - those who provide learners with guidance in use of CAI, computerized data bases and information retrieval systems.

98) Researchers concerned with the learning process.

embryonic form. It is recognized that some of the types of roles which are listed below do exist in research or experimental programs. Other roles, such as supervisors of on-the-job training and industrial educators currently exist but are outside of the formal educational system. It is anticipated that, in the future, these roles may be recognized as part of public supported education or they may be closely integrated with it. There are many embryonic roles in education today which may be expected to become increasingly accepted and commonplace in the next two decades: futurists, simulation and game designers and operators, information systems personnel of various types, etc.

The new types of roles, as defined above, which have been identified as a result of our work on the contextual map may be categorized and grouped as follows:

- Simulation and game designers and operators
- Futurists
  - general
  - educators
- Long-Range Planners
  - cultural quality
  - human resources
  - modelers
  - curricula change
  - vocations
  - national systems
- Community Educators (in noninstitutional environments)
  - curriculum designers
  - coordinators
  - evaluators (of programs and individual progress)
  - supervisors (of on-the-job programs)
- Learning Facilitators (traditionally known as "teachers")
  - instructors in the use of learning resources
  - problem formulators
  - uncredentialed facilitators
  - spanners
  - group leaders
  - private industry facilitators
  - world professors
  - tour leaders (worldwide)

- multilinguists
- learning accelerators
- counselors

- Learning Resources Producers

  - special curriculum designers (graphic arts, T.V., films, etc.)
  - computer programmers
  - engineers and technicians

- Administrators and Managers for

  - special institutions
  - contracts with private industry
  - worldwide operations
  - software production
  - system design and development
  - transportation (worldwide)
  - communications (worldwide)

- Information System Personnel for

  - system design or engineering
  - system operations
  - system maintenance
  - system models (for computer operations)
  - data archives (computerized)
  - education of educators
  - administrative and planning staff support

The derivation of the types of roles listed above through the process of trend extrapolation as displayed on the contextual map does not provide a complete answer to the problem with which this investigation is concerned. The roles listed in Table 1 suggest possibilities only. But, as we have noted, an organizational context is important for the study of roles. We must also determine the type of learning environment or organization of the learning process which would be compatible with the extrapolated trends. Once this task is accomplished, we can complete the task of designing roles to fit the kind of learning environment that is consistent with the extrapolated trends. These tasks must be conducted with the traditional values and objectives of educators always in mind.* This logical sequence of tasks is dealt with in section V, E and illustrated in Figure 2 of that section.

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* The study of the future involves the investigator in two different but closely related problems: (1) determination of what is possible based on trend extrapolation or invention, and (2) selection of what is wanted for the future from among alternative possibilities. Jantsch calls these distinctions "exploratory forecasting" and "normative forecasting."

IV. DISCUSSION

A. Limitations of Contextual Mapping as a Method

1. Causal and Logical Dependencies in the Social Realm

The basic limitation in the use of contextual mapping for conjecturing about the future in the social realm is that it is an extrapolative process. Each entry in a cell is based on the assumption that a trend or direction of movement or change depicted in a previous entry will continue. Thus functional area #5 on the map in Attachment A is based on the assumption that the urbanization process will continue as it has in the past; that the proportion of Negroes in the urban ghettos will continue to grow at the rate that it has in the past; and that, based on recent history, there will also be increasing violence in the ghettos. In point of fact, of course, we know that social change does not occur in a straight line; it is not a linear process. It is more analogous to the backing and filling of a sail as the wind shifts. The classic example frequently cited is that of population growth. Prior to World War II no social scientist correctly predicted the explosive growth in population which followed the war, although the war itself was predicted by many astute observers. Actions taken or events which occur in the future may, therefore, alter any of the trends displayed on the map, and there is no way to anticipate these possible actions or events.

In any extrapolation, then, an event, condition, or process is causally or logically dependent upon a pattern of change or movement in functionally related phenomena. A serious methodological problem is that no two observers of the social scene may agree on (1) the identification of functional areas, for example, why focus on urbanization? (2) they may not agree on the nature of the pattern or change that is occurring, i.e., larger or smaller rate of change, etc., since even quantitative data are subject to interpretation, and (3) they may disagree on the probability that a given event may occur. For example, the idea, expressed in entry #4.11, that "men on probation, ex-criminals" might be used as subprofessionals in urban ghetto educational programs may seem completely unlikely to one observer and quite likely to another. Much may depend upon how seriously one evaluates the problem, a highly subjective matter. While it may be possible to establish a "trend" in the use of retired military personnel in educational programs since data over some period of years may be available, there may be no data available on the use of such personnel in urban ghettos and there may be no data on the use of ex-criminals or men on probation. At this point, the method depends less on the extrapolation of quantitative data than on the use of imagination based on limited data. The method of map construction is very similar at this stage to scenario writing and it serves the same purpose--to stretch the imagination of policy makers.

It is not always possible to bring quantitative data to bear directly on an alleged trend depicted on the map. Entry #5.10, for example, assumes that the ability to manipulate symbols is becoming increasingly important. It is much more difficult to relate quantitative data to this type of trend than to population growth or urbanization. However, an alleged trend may be supported by several other trends on the map and these may be supported by quantitative data. In this case, functional areas #7, 15, and 16 all support the assumption.

In summary, there is no assurance that two different investigators would create the same contextual map, either in terms of its structure or content, even though the substantive problem--the possible future roles of educators--is the same. But if it is used as a tool for interaction, it can be made to contain and display the variations of view.

2. Physical Constraints

The structure and content of the contextual map was physically limited. The charts in Attachment A were made from an actual wall display located in SDC's EPRSC library. The size of the library wall limited the map dimensions to 98 inches wide by 50 inches high. Each of the 36 cells in the 6 by 6 matrix measures 14.5 inches by 7.5 inches. The size of each cell limited the number of entries which could be displayed per cell. The overall size of the map limited the number of major trends which could be dealt with. Thus the limitation of the map to eighteen functional areas is an arbitrary one. As reported previously, the six rows of the matrix were adapted from the work of the Hudson Institute dealing with the basic, long-term trends in Western civilization. Assuming that a larger wall display had been used, additional rows and columns of the matrix could have been added with the result that more trends could have been depicted, and additional entries in each cell could have been created.

The purpose of creating the SDC EPRSC wall display was to meet the center's objective of developing a means for conducting a public dialogue in educational policy making. It was suggested in the previous report that this objective could be accomplished more successfully through the development of a random access slide projector system. It should be emphasized that even if the contextual mapping process is used only for research personnel in the operational centers or for other types of social and educational research which is concerned with the future, some form of public display is still necessary. This is essential if several members of an interdisciplinary research team are to work together on a common future-oriented problem. A large display which a team can

examine in concert is necessary to establish a common frame of reference. The possible uses of a large, public display were discussed in a previous report (see Appendix B).

Theoretically, there is no limit to the number of separate maps which could be devised for a single project. Also, there is no theoretical limit to the possible depth of the trend analyses on a particular map. The entries for each cell of a map matrix could be drawn or mounted for working purposes on separate board or paper sheets of any size and additional sheets could be used for more detailed analyses of a trend or for more trends.

B. Advantages of Contextual Mapping as a Method

The advantages of contextual mapping as a method for conjecturing about the future include the following (see Appendix B). It provides

- a systems-oriented display;
- support for the determination of wants;
- a basis for public debate on educational policy issues;
- support for interdisciplinary team operations;
- potentialities for training both educational futurists and neophyte policy makers; and
- a basis for the credentialing of futurists.

The advantage of contextual mapping over more conventional methods utilized to deal with the problem of the possible future roles of educators has been brought out more forcefully since the publication of our November report as a result of our review of the literature on this subject. As noted earlier, the typical book, research monograph, or report deals at most with several related roles in a particular field, such as learning materials production or educational technology. Each role is commonly treated in isolation from other roles, and each trend is treated in isolation from other trends.

The literature on the subject of possible future roles for educators is characterized by the absence of a "systems" orientation.*

* A "systems" orientation may be defined as one that balances synthesis with analysis. It attempts to view a problem in terms of multiple, rather than single, variables or factors. It attempts to isolate and solve a problem as a total entity, rather than as a series of unrelated elements. There is always the difficulty of defining the system's boundary and identifying all its components and relevant variables, but this problem is dealt with pragmatically.

As an example, a typical analysis and extrapolation of the future role of the guidance counselor is conducted without any analysis of other associated roles such as the teacher's (33). But it is not adequate from a methodological point of view to try to conceptualize the future role of the guidance counselor without taking into account possible changes in the role of the teacher. The authors of the study of guidance just cited applaud those states which are eliminating the requirement that counselors have teaching experience and the "move toward a separate profession" for the guidance counselor. However, if one reads other sources dealing with the future role of the teacher, one finds frequent mention of the idea that the teacher will become less of a dispenser of traditional subject data and more of a guide in the use of information resources (34).

If one follows trends in the technological area, particularly the efforts to use computers in the career counseling field, one finds a potential impact on the counseling function which is not reviewed in the analysis cited above. If, for example, the future teacher will guide the student in the use of information resources, if the psychotherapist provides individual and group therapy, and if a career guidance technician can assist the student in the use of a computerized vocational career guidance program, why would it be necessary to professionalize the guidance function?

In an outstanding analysis of the possible future role of the "scholar-teacher," the area of technological impact on the teacher's role is treated very lightly (31). For example, in this 77-page book only six pages of text are devoted to technology and they are primarily about the mergers between electronics firms and publishing houses. In other sources, however, the function of the "educational engineer" is incorporated in the role of the teacher of the future (34). The future teacher is conceived as a producer or designer of educational materials as well as a user of such materials. Is it possible, then, that the conception of the future teacher as a "teacher-scholar" is also not an adequate transformation and that, perhaps, it should be broadened to "teacher-scholar-engineer"? A truly balanced viewpoint should give greater consideration to impending technological changes.

These illustrations taken at random from the literature on the future role of educators serve to indicate why traditional approaches which tend to focus on a single role in isolation, or which consider a too limited number of variables, are inadequate for the task at hand. More significant and reliable results can be obtained by employing a broader, "systems" orientation.

V. CONCLUSIONS AND IMPLICATIONS

SDC's original proposal for the Pilot Center noted that there was no simple approach to the analysis of possible future roles of educators. Roles are embedded in educational institutions of various types; and those institutions are part of a broader social entity. We are then concerned with three levels of phenomena: (1) social trends; (2) the organization of learning environments; and (3) roles of educators. Educators have been attempting to adapt educational institutions and educator roles to social trends. Therefore, we shall review some of these major efforts at adaptation and their inadequacies before proceeding to the introduction of some new concepts for the organization of learning environments and the roles of educators. The conclusions below, then, shall deal in sequence with: (A) The impending crisis in education; (B) The response to the crisis; (C) The inadequacy of piecemeal reform; (D) Autonomy and isolation of educators and educational institutions; and (E) Concepts for the education of the future. In this last section, we shall review a new, composite role concept and some associated organizational concepts without which the role concept has little meaning.

A. The Impending Crisis in Education

The contemporary literature on the subject of education is replete with references to the crisis in which it is engulfed. However, the projection of current trends in eighteen areas as displayed on the contextual map suggests that this crisis is merely beginning and will become increasingly complex, fractious, and more costly to resolve in the two decades ahead. This conjecture about the future is based particularly on four major trends: (1) the population explosion, (2) the knowledge explosion, (3) the technological revolution, and (4) the social revolution. The crisis aspects of education in the future are revealed in Attachment A in terms of the large number of "major issues" which are shown in the extreme right-hand column of the contextual map, cells 6 A through 6 F.

B. The Response to the Crisis

The response by the educational community to the populational, scientific, technological, and social changes has taken three forms: (1) changes in the roles of educators; (2) curriculum reform, and (3) organizational reform.

1. Changes in the Roles of Educators

The role of the teacher has changed in recent years. Lee maintains for example, that "the teacher in the mid-1960's is significantly different from his 1940 predecessor..."(22). In response to changes

in national goals, he asserts, the teacher is expected to be more of a subject specialist, and the standards for teacher certification and education are rising ("intellectualization"). In addition, the teacher is less a "dispenser of information" while he concentrates more on providing "insight into intellectual processes." He is less a source of information and increasingly "a mobilizer of materials for learning."

If, however, we look ahead twenty years, given the exponential growth of new knowledge (28), the rate of obsolescence of specialized knowledge (11), the proliferation of new specialities, and developments in educational technology, the idea of teacher specialization by subject matter at the elementary and secondary levels may well become obsolete. There may be specialists, but at this educational level it is unlikely that they will be in such fields as physics, chemistry, mathematics, etc. We have to disagree with conclusions, such as Anderson's with respect to the elementary and secondary schools that "the inevitable result of the expansion of knowledge must be a recourse to faculty specialization in some form or another" (1). From a future oriented perspective, the development of the type of team teaching which maximizes the value of specialist-teachers may only be a temporary stop-gap.

2. Curriculum Reform

Goodlad points out that a curriculum reform movement has been underway in the United States for the past decade although some aspects of it go back to 1951 (13). A striking feature of the movement is the unprecedented involvement of university professors. Whereas previous curriculum reform movements were child-centered or society-centered, Goodlad notes that the current reform movement is subject-centered. Underlying the production of the new instructional materials and packages is the belief that the academic disciplines are central in the learning process. Study groups in physics, chemistry, biology, and mathematics have led the reform movement. Goodlad notes that, among other factors, "the knowledge explosion was ruling out traditional approaches to curriculum-planning. It was at long last becoming apparent that the search for those most important bits and pieces of knowledge ("facts") for transmittal to the young is futile. The very concept of fact was changing from that of verifiable certainty to that of an observation taking its relevance from the theoretical construct in which it is used and by which it is described."

A major shift in educational emphasis from the child to subject matter immediately raises questions about the capability of teachers in subject matter disciplines. As Goodlad notes, associated with the curriculum reform movement was also a movement to reeducate the educators through inservice programs, workshops, and summer and year-long institutes.

Curriculum reform has led to the recognition of two additional problems which should be mentioned here since they have implications for the discussion of the roles of educators and the organization of education to come later. One problem is how one extends downward into the elementary school the idea of teaching "root concepts" of an academic discipline which appears to work at the secondary school level. The second problem is that there are more disciplines which might be taught than there is time to go around at the elementary level. As Goodlad puts it: "...clearly, there could not be thirty or more separate academic disciplines in the kindergarten." One cannot avoid asking the next most obvious question: what happens at the secondary, junior college, and college and university levels, to say nothing of the elementary level, when during the next twenty years the number of recognized scientific and technical specialties continues to multiply, perhaps at an exponential rate? The difficulty is that a gulf still separates the academic scholars from the educators who must work out the details of curriculum reform, particularly at the lowest levels. Goodlad notes that "the problem of engaging the attention of first-rate academic men and women on a continuing basis remains."

3. Organizational Reform

Any discussion of the possible future roles of educators is incomplete, if not unrealistic, if the organizational context of those roles is not taken into account. There is much organizational experimentation occurring in contemporary education as manifested by such innovations as the nongraded school, team teaching, dual-progress plans, cluster colleges, and educational parks. There are innumerable efforts to involve pre-, para-, and sub-professionals in the educational process in various combinations with master teachers (4). The U.S. Office of Education has created new institutional entities such as the Research and Development Centers and the Regional Educational Laboratories which are linked in a variety of ways to the educational community.

It is questionable if the types of reforms referred to above, desirable and useful as they may be, are commensurate with the problems as extrapolated on the contextual map. This is clearly recognized by some educators who have maintained that the basic organizational problem in education resides in its bureaucratic characteristics. The roles of educators, it should be stressed, both now and in the future, are closely related to the problem of bureaucratic organization.

Scholars in education, to say nothing of the more articulate student activists, are finding that education in the United States has the characteristics of bureaucracy. They find this damaging to the

educational process, to the professional status and self-image of educators, and to the students who suffer perhaps the most. Schaefer, for example, writes (31):

> "That schools ordinarily are and have been organized as hierarchical and bureaucratic institutions is readily documented. Raymond Callahan's Education and the Cult of Efficiency provides impressive historical evidence that social forces since the turn of the century have shaped the schools in the image of business corporations."

The sheer size of the educational task forces the typical school to operate like a factory turning out standardized parts. Decision making and control are centralized and authority is delegated downward. Administrative democracy is given lip-service but rarely followed. Especially in the big-city slum schools have the teachers become powerless functionaries.

Within the educational bureaucracy, in which the teacher as a vocational specialist functions like a cog in a machine, the teacher's role is that of responding on cue to schedules set by his administrative superiors and transmitting in a routine fashion elementary information. The pressures of heavy schedules and large classes prohibit even the best teachers from reflecting systematically about the nature of the learning process or how to improve it.

The bureaucratization of the nation's schools, colleges, and universities appears to be related to the remarkable growth in the size of the student population. Since trend extrapolation indicates this student population will continue to grow in size during the next twenty years, the problem of bureaucracy will become increasingly critical. Thus, without radical reform, there is little hope that the teacher can be anything but a "cog in a machine."

C. Inadequacies of Piecemeal Reform Efforts

While the current efforts at educational reform are highly significant and major undertakings, they can only be characterized as piecemeal reforms. They represent a form of tinkering with existing educational roles, curricula, and organization which leaves the contemporary educational system essentially unchanged. Furthermore, it is difficult to see how the roles of educators can be changed significantly in the future as long as the growth of bureaucracy continues. At the higher levels of education, the concept of the cluster college is an attempt to reverse the trend toward the bureaucratization of education. However, at lower levels there is no corresponding development.

Recognition of the inadequacies of piecemeal reform are widespread. In his discussion of the possibilities of current school reorganization for strengthening education, Heather writes (17):

> "Most of the thousands of local programs that employ the new plans involve a hasty and superficial implementation of the structural features of a plan without making adequate provisions for the needed changes in instructional materials and procedures and without providing for the required staff retraining."

And he concludes that "successful school reorganization requires the achievement of effective functional interrelationships among all of the major components of the school as a dynamic system." One can proceed a step further and ask if the types of organizational tinkering Heathers is concerned with are adequate and if, perhaps, it is not more to the point to develop an entirely different concept of the organization of education?

In the area of educational media or technology, the inadequacy of a piecemeal approach is clearly seen and deplored. One group of media experts writes (16):

> "If any one development is necessary in media, it is the expanded use of a systems approach for the design and planning of learning to enable using media in the most creative and beneficial way. This implies extensive educational research and evaluation.... Some such research must occur in the teachers colleges in order for them to establish a forefront role in education."

Passow concludes in his review of early childhood and compensatory education that the structure of the educational enterprise as a whole needs changing (27). Not only is the existing educational system inadequate for the disadvantaged student, he maintains, it is is also inadequate for the privileged.

Although education is undergoing changes in response to new national goals and the pressures of population growth and social, scientific, and technological changes, we are in complete agreement with the position that the changes do not run deep enough nor quick enough. As Anderson puts it (1): "...the history of experimentation in American public education has for the most part been a story of failure. Such progress as has been made has taken place only at a glacial rate."

He reports that researchers who have studied nongraded educational programs made "the shocking discovery...that the school's successes in individualizing instruction are rare and that teachers are generally ill equipped to meet the demands of the nongraded school." And as for the technological revolution, Goodlad states it "has scarcely

ruffled most classrooms; the computer is used for routine data processing in large school systems and for instructional purposes in only a handful of experimental laboratories (15)."

It may well be that a slow process of evolutionary adaptation to each pressure for change where the pressure is felt the most is the only way in which a widely distributed and localized system of education can be moved. It is not our intent to suggest that revolutionary transformation is more desirable. What is maintained is that a revolutionary transformation, rather than mere piecemeal reforms, is required over the next twenty years to meet the anticipated changes in social and technological conditions. A "systems" approach should be taken to the subject of change. In order to take a "systems" approach, one must have some concept of the kind of future educational organization one desires. This is noticeably lacking in the current literature.

This problem of attempting to solve what is essentially a "systems" problem by unintegrated, piecemeal efforts and the suggestions that the issues be viewed as "systems" has a very familiar ring (12). One cannot help but sense, on the basis of past experience, that today's educators are passing through a phase similar if not analogous to that which military officers and leaders of industry went through in the 1955-1964 decade (29). The earliest efforts to introduce the use of computers, in both the military realm and industry, for example, were essentially additive. Only rarely was the entire operation and organization of the enterprise reexamined as a "total" system. Most frequently, the computer was simply regarded as another, more powerful, computing device and it was given routine accounting tasks to perform. The notion of designing "total information systems" from scratch did not emerge until much hard-won experience was gained. Educators as a group now appear to be going through a similar initial phase of patchwork characterized by a reform here and there (5, 6, 7, 14, 24).

D. The Autonomy and Isolation of Educational Institutions

The usual remedy proposed to accelerate adaptive changes in education is the improvement of the educator's education. But this does not appear to be an adequate response to the problem. In light of the exponential growth of knowledge, the obsolescence of existing knowledge, and the proliferation of new specialties, how can the pre-service training of educators be altered to conform with new knowledge and techniques on a continuing basis?

The fact is that schools at all levels of the educational system, but particularly at the elementary and secondary levels, are autonomous institutions and isolated from developments, new knowledge, and changes occurring in other areas of society (34). Although research is a major

function of universities, it is not conducted at lower levels of the system. The new Research and Development Centers established by the U.S. Office of Education do not alter this basic pattern in which the generation of new knowledge, even new knowledge with respect to learning processes, is the responsibility, not of teachers, but of other professionals. Thus there remains the basic question of how new knowledge either in subject area fields or in learning processes is injected into the elementary and secondary schools. It should be noted that the creation of dissemination procedures and channels is a step in the right direction in that it is an effort to overcome the isolation of teachers from the sources of knowledge. But in light of the bureaucratic structure of the typical school, how many research reports and monographs will the average teacher and administrator read and how many of them will be able to alter their teaching or administrative practices as a result?

E. Concepts for Education of the Future

In this section we present three concepts which have evolved out of our investigation of the future through the construction of a contextual map and a review of the literature dealing with the future roles of educators. These concepts are:

- the concept of the learning environment as a real time facility;
- the concept of the continuous, vertical, learning organization serving all educational levels; and
- the concept of the learning environment as a multipurpose facility.

A fourth concept which is also presented in this section is the major conclusion of this study. It is derived logically from the three concepts above:

- the concept of the generic role of the learning facilitator as a counselor, engineer, instructor in the use of learning resources, and researcher.

The sequence of logical steps and tasks which were carried out to derive the generic role of the learning facilitator is shown in Figure 2.

These concepts are not "forecasts" of the future. They are conclusions derived from extrapolations of current trends which provide a basis for educational policy makers to make decisions. They suggest what might be. In Jantsch's terminology (18), the purpose of "exploratory forecasting" is to stimulate and to provide alternatives for "normative forecasting"--the assessment of future needs, goals, desires, and wants by those responsible for policy formulation. These concepts are offered here in

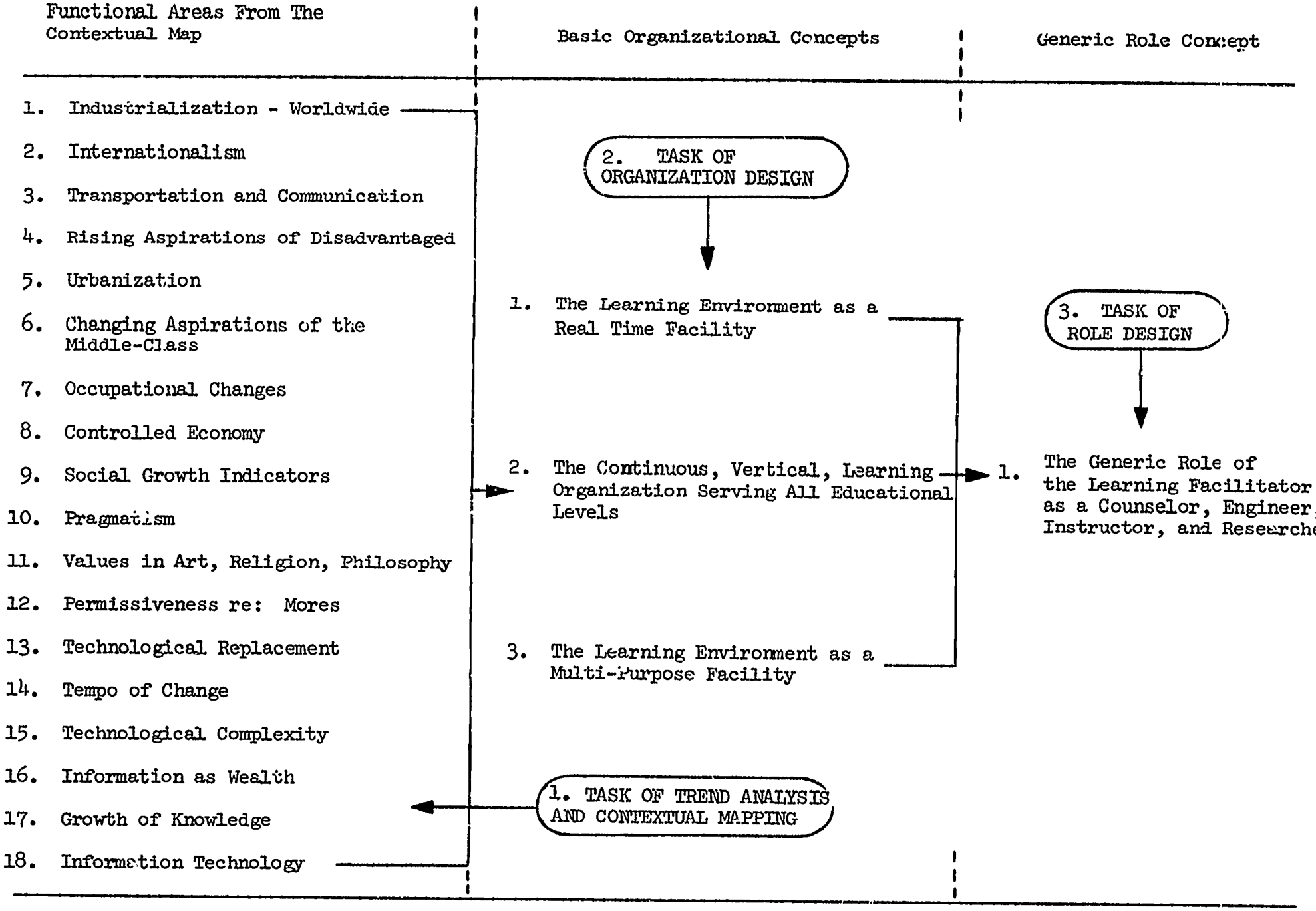

Figure 2.
SEQUENCE OF LOGICAL STEPS AND TASKS TO DERIVE THE GENERIC ROLE CONCEPT

this sense--to stimulate thought, to stretch the imagination, and to present an alternative viewpoint. They represent a proposal about the future of education. The concepts presented here are not utopian. They represent modes of operation in education that are technically and organizationally feasible. They are offered as concepts which should be implemented since we believe they are coherent with traditional educational objectives and goals which have, too often, only received lip service. They are also consistent with what we have some reason to believe the world may be like twenty years from now.

1. Concept of the Learning Environment as a Real Time Facility

In the language of the information sciences*, education currently occurs in a non-real time mode but it will increasingly have both a need and a capability for operating in real time. The acceleration of change displayed on the contextual map--changes in society, in the economy, and in science and technology--imply a reduction in the amount of time available for institutional adaptation. Job obsolescence and knowledge obsolescence are not problems in agricultural communities; they are problems in what Bell has called the "post-industrial" society. We are in transition to such a society today. Education, from the point of view of its timeliness, can operate effectively in isolation from other institutions when change is relatively slow; it cannot be effective in isolation when change is relatively rapid. Hence we are led inexorably to the idea that within the next twenty years learning environments ought to become real time facilities.

In the information sciences, there are at least two notions of time which require clarification for our purposes here.** In one concept--"real time"--the reference is to events, conditions, or processes, as they occur in their real life environment. In a real time process, the temporal factor is not artificially modified as in the case of a management game, for example, when a year's events may be compressed into a few days of gaming operations. Similarly, the learning process may be studied in an actual classroom, in real time, or it

* The term "information sciences" is used here to apply, in the broadest sense, to those fields concerned with information--cybernetics, computer science, data processing, systems analysis, information storage and retrieval, etc.

** I am indebted to my colleague, Hal Sackman, for calling my attention to the relevance of the concept of "real time" to the field of education (see reference #30, pp. 567-570).

may be studied in a laboratory where temporal factors may be artificially controlled. In this usage of the term, the notion of real time is similar in meaning to the expression "real life."

In the second meaning--"real-time information processing"--the learning environment may be conceived as an adaptive information processing system, a system that modifies its own operations based on immediate feedback just as oil refineries, chemical plants, and cement factories operate today. In such adaptive systems, a continuous stream of information is provided to a computer which operates as a real-time monitoring and control device. When the process under surveillance deviates from a predetermined criterion, the computer, like the servomechanism on the antiaircraft gun or the thermostat on the home furnace, modifies the process to correct for or eliminate the deviation.

In the traditional notion of the "school" as the basic learning environment, its isolation from the world of reality or "real life" has taken three forms: (a) education is separated from the world of work; (b) learning is separated from research on the learning process; and (c) education as a discipline is separated from the other academic disciplines. We propose here a concept of the learning environment in which these separations are eliminated.

The concept of the learning environment as a real time facility which could exist conceivably in twenty years is based upon an approach which examines several lines of development--extrapolations of current trends--in concert. These developments are essentially of two types: extrapolations of prominent trends within education itself and of economic, scientific, and technological trends. For example, within education, what will be the combined effects of individualized instruction, improvements in educational technology (including developments in computer-assisted instruction), accelerated research on learning processes, and the development of more sophisticated methods of testing student progress, educational materials,and curricula? And in conjunction with these trends in education, how will the education of the future be affected by the rapid evolution of the information sciences, rapid job obsolescence, the acceleration of new knowledge, and the proliferation of new fields of science and technology? All of these trends must be integrated with respect to any responsible conjectures about the future.

a. A Real Time Approach to Education and Work

If one accepts the idea of continuous, lifelong education seriously, then we no longer should retain the notion that our lives are divided into two distinct phases--an educational phase from which we graduate into a working phase. If we take seriously

the idea that each individual will have several different jobs, occupations, or careers in a lifetime, then education has no termination, there is no graduation but, rather, interspersed periods of education, work, reeducation, work, reeducation, ad infinitum. Furthermore, the individual while on the job remains closely tied to educational processes. He has as much need of information and new knowledge as the formal student in the "school" environment. The acceleration of production of new knowledge, the obsolescence of old knowledge, and the proliferation of new specialties all require that the learning process must be a real time process in which it becomes increasingly difficult to differentiate between work and education. This is the essence of a "learning society." To the extent that knowledge generation becomes a basic process of a society and knowledge the major product (25), then to that extent all participants in that society become lifelong learners and education becomes a real time, continuous process.

b. A Real Time Approach to Research on Learning Processes

Traditionally, as we have noted, the function of learning and the function of conducting research on learning processes and educational technology have been separate functions. The isolation of the elementary and secondary teacher from the sources of new knowledge has been accepted as inevitable. The education of the educators in teachers' colleges has, in particular, been isolated from the research conducted by university scholars. The school of education typically is cut off both from research into the learning process and related technology and new scholarship in the academic disciplines. This is not a theoretically desirable situation nor is it any longer a technical necessity.

A real time approach to research on learning processes becomes technically feasible as soon as one introduces the computer into that process and begins to conceive the learning environment as a man-machine system. In man-machine system theory, the system is not regarded as a static entity but as evolutionary in character. The system is perceived in the spirit of experimental inquiry. The computer in the man-machine system makes it possible for the researcher (the "teacher") to conduct real-time information processing. Every employment of computer-assisted instruction may be regarded as an experiment, the object of which is to evolve a more effective man-machine learning process. The components of the experimental situation include such items as: the computer programs, the displays, the data formats, the mechanisms provided for student-computer interaction (input and output devices), the sequencing and branching of subject matter, the measurement, recording, and evaluation of the learner's performance, and his associated behavior. The results of the learner's performance can be recorded and stored in the computer's

memory for later review and analysis, or the results may be presented immediately for review and study by the learning facilitator ("teacher"). Computer languages written in natural English may make it possible within twenty years to modify subject matter or its sequencing or branching on the spot or to make revisions immediately following a man-computer run. Sackman, for example, foresees a time in the near future when the computer facilities of man-machine educational systems would make possible a continuous series of experiments "directed to their own operations and aimed at the improvement of their own design and performance" (30). Such educational systems would undergo an evolutionary development as each experiment is carried out.

c. A Real Time Approach to Subject Matter Transmission

The concept of the learning environment as a real time facility does away with the traditional institutional isolation of professional educators both from each other (at different educational levels) and from the academic scholars.

Computer-assisted instruction and other types of educational technology should make unnecessary the existing divisions between "teachers" at elementary, secondary, and college and university levels. With appropriately designed information storage, dissemination, and display systems, it should be possible for new knowledge in specialized fields, generated at the university level and in educational research laboratories, to be made available to learning facilitators at all educational levels as soon as it is in "publishable" form. From the point of view of technical feasibility, there would be no need for elementary and secondary "teachers" to transmit "trivia" and "untruth" to their students if they and their students are linked to the sources of new knowledge. The teaching of a subject such as biology need not suffer from a lag of thirty years at elementary levels if both the learning facilitator and his students at that level can view together the lectures of the most prominent researchers in biology via television, or operate a computer-driven program dealing with the most recently developed biological findings and theory. The qualifying expression here is "with appropriately designed information...systems." We are assuming here that within twenty years the "book" will be replaced at least in part by some form of real-time information system. For example, we assume that the research papers of investigators in biology will be available for worldwide transmission as soon as they are written via electronic reproducing equipment. We also assume that important experiments in biology and other fields will be observed by students via TV systems as they occur.

The institutional isolation of professional educators from their counterparts in the academic disciplines should disappear within

twenty years. Education as a discipline, in an approaching era in which knowledge becomes the basic product and a limiting factor in national growth, should move to the forefront among the scientific and humanistic disciplines in the academic community. Specialists in the fields of education and the other academic disciplines should both conduct their research in the same real time learning facility. Both should make use of the same man-machine learning systems in the same real time learning environments. What one teaches (subject matter) and how one teaches (the learning process) are closely interrelated phenomena.* Both should be part of the real time experiments discussed above. In the design and conduct of these experiments, the professional educators and the academic scholars should participate as co-researchers--as members of an interdisciplinary research team. Computer-assisted instruction, if taken seriously and carried to its logical conclusion, demolishes the traditional distinction between subject matter and the learning process. This is already evident in the current curriculum reform movement as described by Goodlad (13) and in current complaints by educators about the inadequacy of the "software" (subject matter) in existing computer-driven instructional programs.

2. Concept of the Continuous, Vertical, Learning Organization Serving all Educational Levels

Current developments and trends in nongrading, individualized instruction, team teaching, and educational parks when considered in conjunction with the long-criticized dichotomy between lower and higher educational levels suggest that within twenty years a new structure of education may well emerge. Here we focus upon the organizational consequences of the concept of the learning environment as a real time facility. As we noted in the previous section, the traditional distinctions between levels of schooling--elementary, secondary, colleges, etc.--are gradually breaking down. Within two decades, capabilities for individualized learning should evolve into educational systems which will make the current levels of schooling concept obsolete except, perhaps, for social or other age-graded group activities such as sports, pageants, fairs, etc.

The contemporary curriculum reform movement has shifted the attention of educators from the graded school structure to concern for instruction in subject matter. Goodlad has pointed out that these two concerns are currently incompatible (15). He writes that the curriculum reformers have had difficulty with graded school systems since "their sequences of

* The medium may not be the message as McLuhan asserts but there is unquestionably a close relationship between content or message and the medium through which it is transmitted.

content are naturally continuous and nongraded, but the schools are not." In place of the distinctions between grade levels and between levels of schools, a future possibility which is compatible with the concept of a continuous, vertical, lifelong learning environment is Goodlad's concept of "overlapping phases." However, this concept of overlapping phases (ages 3 through 6; 5 through 9; etc.) should be extended to cover all ages from infancy through the university and beyond to the adult extension level as suggested in Table 2.

TABLE 2

OVERLAPPING PHASES OF EDUCATION BY AGE GRADE

Phase	Age Grade	Type of Education*
I	3 - 6	socialization; human relations; art, music, introduction to reading and arithmetic
II	5 - 9	in depth reading and arithmetic; introduction to foreign languages
III	8 - 12	broad education; arts; humanities; foreign languages and cultures
IV	11 - 15	science core curriculum
V	14 - 18	introduction to science specialties; the humanities continued
VI	17 - 21	balanced program of science specialties and the liberal arts
VII	20 - 24	professional education and training
VIII	Adult	reeducation and retraining; avocational education; refresher programs in specialized fields

* The types of education shown in the table are for illustrative purposes only.

In this concept of continuous, overlapping phases of education, the learning environment is not broken down into separate schools labeled elementary, secondary, college, etc. The progress of the individual is geared to continuous learning sequences which have their own inherent

logic of development. The individual student would have more freedom in the selection of the areas of study which most interest him and he would be allowed to proceed in those areas as rapidly as his ability permits. A major objective of the learning organization would be to accelerate the capability of students to absorb more knowledge more quickly in keeping with the explosion of knowledge trend. No student would be restrained from learning because of organizational considerations.

Since ability is unevenly distributed among different individuals and varies for each individual depending upon the subject, there would have to be organizational recognition of differences between chronological age and the phase of education one belongs to based on ability and interest. But there is no reason why each individual could not be assigned to his chronological age group for social activities and to an educational phase depending upon his ability. Presumably, with the assistance of automated record-keeping, the administrative problems involved in these distinctions would not be insurmountable.

The advantages of organizing learning environments such that all age grades from infancy to adulthood would be represented in one facility are considerable, particularly in light of the many social problems displayed on the contextual map. The virtues of team teaching, in which mature students, teaching aides and assistants, and master teachers all work together as a team would be greatly facilitated in a continuous, vertical learning organization. The problem of teacher shortages could be resolved by the part-time paid employment of older students to tutor younger students.* It is widely recognized that one learns best by teaching, yet our current organizational arrangements make it impossible to capitalize on this understanding. In a relatively simple, precomputer age, this sort of inefficiency could be tolerated and absorbed. It should not be tolerated in the post-industrial era. There will be no time or ability to waste.

The continuous, vertical learning organization lends itself to the concept of the educational environment as a real time facility as already discussed. Neophyte and professional educators would have available to them for research purposes all educational levels in one facility. Preservice and inservice education for educators would occur in the real learning environment. The preservice educators would be able to participate in the learning process with

* We are referring here to instruction and counseling in the use of learning resources, not to the teaching of academic subjects, although this could be a peripheral task.

students at all age levels; they would be able to assist the education professors in the design and development of new educational systems; and they would be able to assist the academic professors in the creation of improved curricula sequences and materials.

Of special importance, and perhaps the most telling argument for organizational reform, is the trend toward the deterioration of education in the urban ghettos. It may be that this growing problem can only be solved if massive use is made of older students to provide guidance and assistance to the younger, culturally disadvantaged students on a one-to-one basis. If Negro students in the lower age grades could be tutored and assisted by older Negro students who are already working in the higher phases of education as shown in Table 2, this would provide them with essential models for their behavior. Thus, potential youthful dropouts might be encouraged to continue their education rather than pattern their behavior, as they do now too frequently, after mature dropouts.

The combination of separate levels of education and local control over subject sequencing and requirements for accreditation, credentials, and degrees has long been a problem for the more mobile segments of our population. It can be anticipated from the trends displayed on the contextual map that this type of problem will be exacerbated to an intolerable point within the next twenty years (8). In addition to the mobility of persons, which will undoubtedly increase in the years ahead, there will be the problem of individual access to nonlocalized educational programs and systems. The concept of attending a school is outmoded by the newer concept of a temporary assignment to an educational phase which is independent of a particular locale. It is exceedingly wasteful for the graduate student to be required to duplicate numerous courses simply because he has moved from one state to another. The child of transient parents, the college student who decides relatively late to change his major field, the bright student who wishes to sample the offerings of different professors, all are similarly handicapped by current organizational arrangements. The late bloomer who dropped out of high school before earning his diploma and the adult who wishes to return to complete an unfinished college education are both discriminated against by a host of local school and college regulations, prerequisites, and requirements. All of this is incompatible with the educational technology of the future. Within twenty years, computer-assisted instruction should be developed to the point where any individual, at any age and at any location, should be able to take a computer-driven test in any subject and, having passed the tests, he should be able to continue his education in that field as far as ability and desire dictate.

3. Concept of the Learning Environment as a Multipurpose Facility

The concept of the learning environment as a multipurpose facility follows logically from the concepts of individualized instruction based on computer-driven information systems, the learning environment as a real time facility and as a continuous, vertical organization serving all age grades. Once one abandons the idea of the "classroom" in which groups of twenty to forty students of approximately the same age are fed the same subject matter, the same "learning resources" and computerized systems can serve all types of learners with different career goals, at different age levels, and from different segments of society and at no extra cost.

Over the next twenty years it should become increasingly apparent that the traditional distinctions between vocational and academic education will gradually disappear (36). Several major trends suggest this: the long-term shift from an agricultural and manufacturing society to a service oriented society; the increasing capability to automate routine, repetitive tasks; and the increasing importance of symbol manipulation and more sophisticated skills in major spheres of activity. At the same time that the traditionally simpler tasks in society are being upgraded, the academicians and scholars from the universities are being drawn into the ongoing activities of the society (10). Increasingly government and industry are turning to the university professors for help in finding solutions to the problems of pollution, traffic congestion, crime, national defense, etc. The ivory tower is brought more and more into the real world as the best brains in the nation are focused, not on academic specialties, but upon concrete social, economic, technical, and political problems. Thus, gradually the worker is pushed into becoming more of a scholar while the scholar is pushed into the world of work. Eventually, both should be able to make use of the same, multipurpose learning environment.

In our earlier discussion of education and work in a real time learning environment, the point was made that the acceleration of new knowledge production, the obsolescence of old knowledge, and the proliferation of new specialties combine to make it increasingly difficult to drew a clear line between work and education. Rapid developments in science and technology require professionals and technicians alike to remain students throughout their lives. With the obsolescence of the notion of "graduation," the learning environment should be conceived more realistically as a multipurpose institution serving with equal facility the needs of both worker-scholars and scholar-workers.

At the opposte end of the learning spectrum, we can anticipate a greater involvement of the "student" at an earlier age in the world

of work. There is much evidence of a growing realization on the part of educators that strictly academic learning can be sterile and that young people feel strongly about the need for education to be related to real world issues and problems. Some colleges already require the student to spend one semester per year at work. Other institutions involve their students deliberately in local community affairs. Thus, one of the tasks of the multipurpose learning environment is to provide compensatory programs related to the world of work for reality disadvantaged, middle-class, academically oriented students. The multipurpose learning environment serves the traditional requirement for a facility in which knowledge is transmitted and it may also serve the need to conduct research on the learning process in real time, as discussed earlier. A multipurpose learning environment should be able to serve the needs of both professional educators and academic disciplines.

The concept of the continuous, vertical learning organization which serves the learning needs of all persons from infancy through adulthood, discussed earlier, also calls for a multipurpose learning environment.

The American system of education has been founded upon a basic objective of education as the "melting pot" for the various immigrant ethnic groups which came to our shores. The goal was to homogenize, standardize, and Americanize. It is unlikely that these objectives will remain as guides to action in the next two decades (20). The concept of individualized instruction undermines these traditional objectives. Trends displayed on the contextual map suggest that, in the future, education will increasingly be required to meet the varied needs of a highly differentiated society.

Today differences in society are reflected in and perpetuated by separate and isolated school facilites. Separate but "equal" school systems insure educational inequality. The multipurpose learning environment should be able to serve equally the needs of the culturally disadvantaged from the urban ghettos and the advantaged children of the affluent middle-class. The learning environment of the future should be equally capable of providing instruction for functional illiterates or for the academic elite via the same computer-driven information systems and other types of educational technology.

4. <u>The Generic Role Concept</u>

The generic role concept introduced here is <u>the major conclusion of this study</u> and is logically derived from the three concepts presented in the previous section. This is a concept of a generalist rather than an academic subject specialist. Some specialized knowledge is

inherent in the role but, as we shall see later, it is not one of today's academic subjects. The new role combines four basic functions which today are distributed among four different roles. The functions include (a) counseling, (b) engineering, (c) instruction, and (d) research. For convenience, rather than use the term "teacher" which connotes too much that is no longer appropriate, we shall use a term more descriptive of the new role--"learning facilitator."

The key generic role concept in today's education is, of course, the "teacher." This concept, with all its traditional connotations, provides a handy conceptual hook on which are hung a set of presuppositions about the objectives of education, the nature of the learning process, the organization of learning environments ("schools"), and capabilities of the average student. The teacher is regarded in these presuppositions as the human channel through which data and information ("facts") are assumed to flow to passive learners in a steady stream. The teacher is conceived as a human computer containing a storehouse of knowledge which is dispensed, with the assistance of books and other types of learning resources, presumably in amounts appropriate to the learning capabilities of groups of students, grouped by age, and not necessarily ability.

Teachers are expected to accomplish the objectives of the educational system by transmitting to younger people an established body of knowledge and cultural values in such a manner that they are prepared for citizenship, careers, and self-fulfillment. Other functions which teachers perform, such as counseling, record keeping, monitoring student behavior, evaluating curricula, etc., are regarded as peripheral to their primary function as dispensers of information.

It is interesting to note that this concept of the teacher is found below the level of the university. At that high level another function is assigned to the teacher--research in a specialized discipline. Perhaps a more appropriate way to state this is to say that the university scholar is also expected to teach. Considerable controversy has raged for many years over the "publish or perish" syndrome and, especially in recent years, the allegedly poor quality of teaching at the university level has been severely attacked. This conflict is still unresolved (3, 35). At lower educational levels, however, research is clearly not regarded today as an essential function of the teacher.

The traditional role of the teacher has not been static, although the concept is basically unchanged. It was noted in an earlier section of this report that the teacher's role has changed in the past twenty years. The change has been in the direction of increasing specialization in subject fields. However, the trends portrayed on the contextual map suggest that in the next twenty years

technological capabilities will make it possible below the university level, to reverse the trend toward subject specialization. It is very probable that the presentation of subject fields will be carried out to a large extent via educational technology--computer-assisted instruction, films, TV, recordings, etc. This will be possible at all levels of education. Despite the slowness with which these features of educational technology have penetrated the educational scene, many observers note that the teacher is changing, albeit slowly, from a dispenser of facts to an intermediary between learners and learning resources of all kinds. He is becoming a learning facilitator. Gradually, it can be anticipated that the teacher will not "teach" subjects such as physics, chemistry, algebra, etc., but will, rather, serve to direct the learner to appropriate learning resources, materials, and computerized information systems and advise and assist him in their most efficient use. To the extent that he will be a specialist, it will be in the nature and use of learning resources and systems as they contribute to the learning process. He will provide instruction in this specialty. This is not a new concept, but it needs to be explored rather more fully than it has yet been.

It is not at all clear at the present time to what extent this concept of the teacher as a learning facilitator can or should be extended downward to the youngest students and upwards to the most mature. This is an area where much research will have to be done. Clearly there are phases in education, both in infancy and at what is now known as the graduate and post-graduate levels, where the learning process is dependent upon intensive personal relationships between learners and learning facilitators. But during all other phases, including what is now known as adult education, much of the material in specialized fields can be transmitted to the learner via some type of educational technology.

Insofar as education is conceived as the transmission of data information, or knowledge from one individual to another or to a group of individuals, the efficiency of the traditional "teacher" varies greatly. This aspect of education, however, clearly represents the great bulk of present day educational activity.

The potential transformation of the teacher's role from a dispenser of information to a learning facilitator represents only the beginning of the possible changes that may occur during the next twenty years.

a. Counseling

There is an unmistakable growth trend in the field of counseling in education. It has been estimated that the number of full-time

guidance counselors in the secondary schools has grown from 11,000 in 1959 to 24,000 in 1964 (33). Thus in five years, the number of counselors has more than doubled. If we merely continue to double the number every five years through 1989, there would be 768,000 guidance counselors. It is not unreasonable, then, to anticipate the possibility of approximately one million counselors within twenty years, or else a change in the way the function is performed. Numerous features of the contextual map suggest the growing importance of the counseling function: greater pressure on the student to go as far as he can in the educational system, the increasing requirement for complex and sophisticated skills, the problem of job replacement and obsolescence due to automation and emergence of new knowledge and technologies, the increasing number of alternative specialties and occupations, the development of more independent studies, programs, and capabilities, the increase in the number of scholarships offered, the social problems of a permissive society which result in much uncertainty among the young, and the problems of delinquency, pregnancy, early marriage, etc.

Throughout each individual's lifetime there will be a continuing need for counseling and guidance, first during the early years of formal education and, later, during one's working life. The interpenetration and overlapping of education and work which we have already discussed emphasizes the increasing importance of the counseling function.

It can be expected that in twenty years computerized systems will be available to assist in the educational and vocational counseling function. Publications such as the Department of Labor's Dictionary of Occupational Titles may be stored in computers and be updated on a regular basis as new occupations emerge. Students concerned with career choices would be able to browse through occupational information stored in a computer's memory as they browse through books in the school library today. The automation of this type of information would result in capabilities for providing vocational information far beyond the abilities of individual counselors. It would be feasible to associate with each specialized field or occupation information pertaining to sequences of curricula, types of courses, and educational prerequisites, etc., required of the neophyte who may be interested in a particular field. It would be possible by designing a cross-indexing system for the student to proceed at his own initiative from identified fields or specialties to the learning resources available on those fields or specialties.

While all these trends and developments indicate the growing importance of the counseling function, the conclusion that counseling should become a profession in its own right, separate from the teaching functions, does not necessarily follow if one looks to the future rather than the past or present. Once the teacher gives up the function of dispensing facts in academic subjects, he becomes free to assume other functions. One of these is the counseling function. From this perspective, the current efforts to professionalize the role of the counselor are occurring at an unfortunate time. It is a response to current dilemmas, not an anticipation of the future. Insofar as a number of the states are experimenting with the certification of counselors without requiring teaching experience they are in tune with future possibilities. In the future the counselor should be able to assume the role of the learning facilitator without having to master academic subject matter for reasons we have already noted. What we have is the convergence of two roles rather than the replacement of one by the other.

To assist him in counseling students in educational, career, and occupational areas, the learning facilitator may have a computer services technician who is a specialist in this field. This role would be analogous to today's librarian in that an information system would be at his fingertips to assist the student in his search for relevant information.

It is well to grasp the impact on education of such concepts as the learning environment as a real time facility, as a continuous, vertical, learning organization (including adult education), and as a multipurpose facility. These concepts, taken together, transform the learning environment from what is today--a school--into an environment in which learning and counseling are tightly integrated, if not identical, activities. In such an environment the distinctions which we take for granted today between education, work, and leisure are much less clear. Perhaps the most appropriate analogy at the current time to the learning environment of the future is the city or county hospital where tomorrow's medical practitioners learn their skills in a real time environment. Work and education are part of the same process. And as computers are introduced into the hospital environment, research in real time becomes technically feasible. We can envision then, the future professor of education, surrounded by a group of educator trainees, assisting a group of students in mastering a subject, e.g., cryogenics, to which they have already been introduced by a host of learning resources and materials, while the education trainees observe the results of a test run on the computer-driven display. In such an

environment, not only has guidance shifted from being supplementary to teaching, or even complimentary to it, it has become the dominant element.

b. Educational Engineering

In the context of a real time learning environment, the learning facilitator becomes an educational engineer. The learning resources center may be comprised of various types of "systems" by means of which the learners "switch" themselves into sources of information. Such learning resources as teaching machines, computer-assisted instruction, computerized library information systems, closed circuit TV systems, etc., will in twenty years, be the basic tools of the learning facilitator. Eaerlier we quoted students of instructional media who have already pointed out that such media to be effective must be designed as systems. We have noted that the introduction of sophisticated instructional media into the educational environment, particularly computer-assisted instruction, makes possible a real time approach to research on the process of learning. We have also asserted that the learning facilitator will probably be responsible for this function. In addition, we have viewed the entire educational process in the future as a type of adaptive system. A basic element in these "systems" is the "hardware" and its evolutionary improvement as part of an adaptive system.

Thus, today's "teacher" may be transformed into the educational engineer of tomorrow. As we have seen, he may become responsible for research and this necessarily includes research on system design and development. Research on the learning process will be concerned, among other things, with how to design the most effective learning resource systems and how to direct their evolutionary development.

In order to perform such functions adequately, the learning facilitator of the future will have to be trained in the engineering aspects of education. He will need to have the capability to design, develop, test, evaluate and redesign more efficient information systems for the learners with whom he works. His tools should include scientific method, experimental methodology, statistics, and systems analysis. In an age of information science, he will be required to feel at home with the most advanced techniques of information storage, recording, retrieval, transmission, and display.

What alternative to this major transformation of the role of the teacher do educators have? Many educators are humanists and their great concern, and the concern of many noneducators,

is that the tail will wag the dog--that information processing technology and specialists in that technology will dictate what the future of education will be like. The only alternative is for educators themselves within the educational environment to take command of the evolutionary development of information processing technology in the interests of better education. Either educators will become educational engineers or they will forfeit their control over the direction of education to others trained as specialists in electronics and information science.

c. Instruction in the Use of Learning Resources

In twenty years what will be the relationship of the learning facilitator to the computerized library, computer-based instruction, and a host of other new learning resources--TV, film cartridges, videotape, recordings, etc.? Extrapolation of the developments in the new educational media on the contextual map in conjunction with the published literature in this field leads to the conclusion that the traditional roles of the teacher and the librarian will converge and that one new role--the learning facilitator--will provide the guidance necessary to learners at all levels of the educational system and in all its aspects in the use of the available learning resources. These trends are already well developed.

In many of today's schools lessons in the use of the library are given as part of the regular curricula by the classroom teacher. In many schools the library is becoming a "resources center" in which many different kinds of learning materials, in addition to books, are brought together to be stored, indexed, catalogued, retrieved, etc. Colleges are experimenting with a variety of independent study programs in which the student works at his own pace in the library. In these approaches "the instructors are bibliographically competent counselors available for individual counselling, for group discussions and for periodic lectures that provide elements not available in print or other formats" (32). According to this source, "an advanced library-instructional complex reveals the potential for learning in all formats from textbooks through television." These notions carry us, perhaps, ten years into the future, but what if we look ahead twenty years? Educators and librarians still tend to think of libraries in terms of books--millions of books duplicated over and over again at great cost in hundreds of separate libraries. Will there be books in twenty years?

J.C.R. Licklider has published a report on the results of a two-year inquiry into new techniques for handling what is now done in libraries (23). It has been recognized at least since 1956

when the Ford Foundation created the Council on Library Resources that the accumulation of new knowledge could not forever be accommodated by more and more bookshelves. Licklider points out that "books are intrinsically less than satisfactory for the storage, organization, retrieval, and display of information..." The problem is such that it cannot be solved "by improving library organization." And he concludes "we should be prepared to reject the schema of the physical book itself, the passive repository for printed information." Perhaps within ten years (1975), he writes, "we may be technically capable of processing the entire body of knowledge in almost any way we can describe ..." and probably "within twenty, (1985) we shall be able to command machines to 'mull over' separate subfields of the corpus (of knowledge) and organize them for our use...." Thus from the point of view of technical capability, the book as we know it today may disappear from the learning environment and the function of the librarian may be absorbed by the learning facilitator and the information systems engineer.

d. Research

We have noted that the learning environment of the future may become a facility in which real time research and experimental inquiry are basic activities. That discussion will not be repeated here. The contextual map clearly supports Schaefer's concept of "the school as a center of inquiry" (31). As we have seen, the development of computers and the information and systems sciences presage a future in which the design, monitoring, measuring, testing, evaluation, and improvement of man-machine systems in a real time mode may be commonplace. Computerized instruction would make it possible for the learning facilitator to observe the results of experiments in the learning process as they occur. More flexible programming languages, working prototypes of which already exist, would make it possible for the learning facilitator to modify the computer's programs readily on the basis of student performance and other criteria. The recording capabilities of computers would make it possible to keep precise and retrievable data on the performance of all types of students and under many types of controlled conditions and for unlimited periods of time. If computerized instructional systems in different parts of the country are designed for compatibility so that exchange of information between systems is possible, researchers would be able to conduct nationwide experiments which are currently inconceivable. Educators must take the lead to ensure that compatible systems are developed not only for research purposes as just indicated, but so that the best learning materials can have the widest possible, preferably universal, distribution. This is a problem of computer-based information system engineering which we discussed above.

e. The Generic Role Concept and Bureaucracy

The bureaucratic structure of contemporary education is dependent upon the "teacher" as a standardized part in an organizational machine. If the traditional teacher is transformed during the next two decades into a learning facilitator, as we have described this concept, it is difficult to see how the bureaucratic structure of today's schools can remain unchanged. When the teacher gives up dispensing facts as his basic function and becomes, instead, a director of learning processes and a designer of systems which facilitate learning, his status will probably rise accordingly. If he becomes a director of research and an educational systems engineer, he is no longer a "cog in a machine." He becomes, rather, a true professional. The new and widely ranging responsibilities he may assume necessarily enlarge the scope of his authority. And as his authority rises, the authority of the traditional administrator over the learning process should decline. In a sense, each learning facilitator becomes his own administrator. In this task, within twenty years, he should have the assistance of record-keeping computers. As record keeping is automated, this relieves the administrator of the onerous task of monitoring what teachers do. Thus it may be that the learning facilitator of the future will enjoy considerably more freedom of action than he does today. Individualized instruction from both the learning facilitator's and the student's viewpoints implies a decentralization of authority which mitigates, to some extent, the negative aspects of bureaucracy.

VI. RECOMMENDATIONS

The recommendations offered here fall into two categories: (A) continuation of experimentation with contextual mapping as a method for conjecturing about the future; and (B) implementation of the four concepts pertaining to the organization of learning environments for the future and the future role of the learning facilitator.

A. Contextual Mapping

The extrapolation of trends displayed in Attachment A is the result of an experiment in the construction of a contextual map. It was prepared under severe constraints of time and manpower. Much exploratory work in the area of forecasting methodology had to be done in the early months of the SDC Pilot Center effort before a decision was reached to undertake the development of a contextual map. Also due to the demands of other projects, only one individual, this writer, was available to work on the mapping task. Thus, the map is the product of one person who spent approximately three months in its

construction. Its limitations are, therefore, obvious. In spite of these limitatians, we believe the results have been well worthwhile. It is recommended, therefore, that the U.S. Office of Education support a more thorough effort at contextual map construction, perhaps as one of the funded projects of the operational centers recently established by the USOE for the study of the future.

A more thorough contextual mapping effort should include several features: (1) the mapping process should be conducted by an interdisciplinary team comprised, for example, of an educator, economist, sociologist, and an information scientist; (2) the map should be enlarged in scope so that additional trends can be displayed and the consequences of those trends for education can be displayed in much finer grained detail; (3) a random access slide projection system should be developed so that the map can be more efficiently stored, modified, and displayed; (4) the content, structure, and procedures for using a supporting data base should be designed as an application of the concept of the "method string," i.e., computerized demographic models should be readily available to provide data for map entries; (5) we concur with the suggestions of R. Buckminster Fuller (9) and Harold Lasswell (21) that facilities to display trend data in some type of public forum as a basis for debating the future should be designed and built. This last recommendation is particularly important for education due to its widely distributed political and financial structure.

B. Implementation of Concepts for Future Education

If the conclusions derived from the contextual map and the review of the educational literature on roles are correct, education during the next two decades will be passing through a very critical period. If it is also true that piecemeal reforms currently underway are not adequate to meet the challenge, then what can be done? It is assumed here that by 1988, education in the United States may have undergone a radical transformation via an evolutionary, rather than a revolutionary process. To prevent an evolutionary form of drift, however, in which technology calls the tune, new concepts of education and of the roles of educators are needed to serve educational policy makers as guides to plan for and to control that evolution. We recommend four concepts as contributions to that guidance:

- The concept of the learning environment as a real time facility.
- The concept of the continuous, vertical, learning organization serving all educational levels.
- The concept of the learning environment as a multipurpose facility.
- The concept of the generic role of the learning facilitator as a counselor, engineer, instructor in the use of learning resources, and researcher.

It is obvious that although these ideas have already had some impact on the field of education, the full implementation of each of these concepts would require a profound reorientation in thinking about edcuation at all levels of the educational community. It is unlikely that these four concepts can be implemented as the interdependent ideas they are in any existing educational institutions. It is recommended, therefore, that the U.S. Office of Education seek to establish a prototype, experimental, test-bed educational institution which would be designed with the four suggested concepts as the basic building blocks. This experim .tal institution would serve as a model for the entire educational community. The idea of creating a test-bed model of a complex, man-machine system for experimental and evolutionary developmental purposes is commonly done in the military and industrial realms and is an outgrowth of the new systems sciences. There is no reason why educational test-bed models should not also be created and for the same reasons.

If such a test-bed, experimental model could be created within the next few years, policy makers and the educational community in general would have a period of approximately fifteen years to investigate the feasibility of using the four concepts proposed as the basis for creating an operational educational system. If the test-bed, experimental model, incorporating the latest developments in information system technology, successfully demonstrates the feasibility of the new concepts or their experimental derivatives, new educational institutions incorporating those concepts could be ready for use by the 1980's. The test-bed model would be able to provide the cadre of trained educators required to man the new educational facilities.

Whether or not an experimental, test-bed educational facility is created, the concepts for the education of the future which we have presented in this report may serve as guides in the formulation of educational policy. They may serve in one of two possible ways: as an alternative which educators desire for the future; or as a possible future to be avoided. This is for policy makers to decide.

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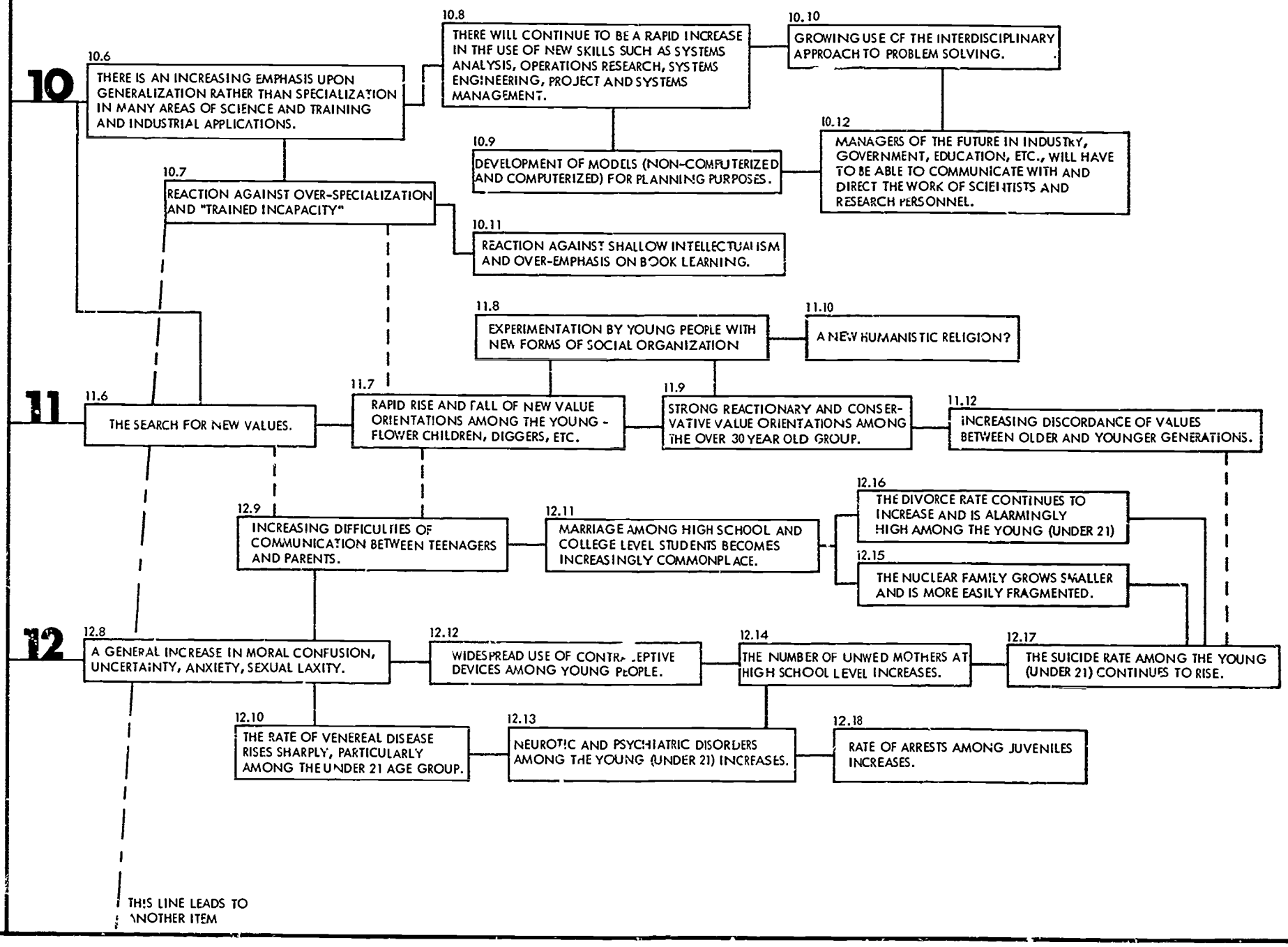
VIII. ATTACHMENT A

BASIC LONG TERM TRENDS	MAJOR SUB TRENDS
FUNCTIONAL AREAS 10.0 PRAGMATISM	**10** 10.1 THE INCREASINGLY OBVIOUS DELETERIOUS EFFECTS OF UNANTICIPATED CONSEQUENCES OF LAISSE-FAIRE POLICIES - SMOG, RIVER POLLUTION, TRAFFIC CONGESTION, ETC. - IS ALTERING BASIC AMERICAN ATTITUDES AMONG POLICY-MAKERS, DECISION-MAKERS. 10.2 GROWING REACTION AGAINST DRIFT IN SOCIAL CONSEQUENCES OF TECHNOLOGICAL CHANGE. 10.3 LONG-RANGE PLANNING AND STUDIES OF THE FUTURE WILL BECOME INCREASINGLY ACCEPTED IN AMERICAN LIFE. 10.4 THERE WILL BE AN INCREASING DECLINE IN CONCERN FOR POLITICAL IDEOLOGIES AND INCREASING EFFORTS TO SOLVE SOCIAL, ECONOMIC, AND TECHNICAL PROBLEMS PRAGMATICALLY. 10.5 MANAGEMENT IN ALL TYPES OF ORGANIZATIONS WILL BE INCREASINGLY CONCERNED WITH ENDS AS DISTINCT FROM MEANS.
CULTURAL SECTOR INCREASINGLY SENSATE- EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE.	
11.0 VALUES IN ART, RELIGION, PHILOSOPHY	**11** 11.1 EMERGENCE OF SENSATE ART 11.2 ART FORMS AND CONTENT REFLECT HONESTY, INDIVIDUALITY, NON-CONFORMISM, BREAKS WITH TRADITIONAL MORALITY AND VALUES. 11.3 ART FORMS AND CONTENT REFLECT HEDONISTIC VALUES, MATERIALISM, VIOLENCE, SENSUALISM. 11.4 A MORE EXPRESSIVE, IMAGINATIVE, NON-CONFORMING, CREATIVE, HUMANISTIC SOCIETY. 11.5 INCREASING EXPLOITATION BY THE ARTIST OF OBSCENITY, NUDITY, AND EROTICISM.
12.0 PERMISSIVENESS RE: MORES	**12** 12.1 AN INCREASINGLY PERMISSIVE SOCIETY 12.2 GRADUAL DECLINE OF CENSORSHIP OF FILMS, BOOKS, THEATRE, T.V. 12.3 INCREASINGLY TOLERANT ATTITUDES TOWARD PREMARITAL SEXUAL BEHAVIOR, EXTRAMARITAL SEXUAL BEHAVIOR, HOMOSEXUALITY, ETC. 12.4 LYRICS OF POP SONGS DEAL WITH DRUGS, SEX, REBELLION, CYNICISM. 12.5 REBELLIONS IN CATHOLIC CHURCH RE: CLERICAL CELIBACY, MARRIAGE, HABITS, ISOLATION FROM CURRENT CONTROVERSIES. 12.6 GENERAL ACCEPTANCE AND WIDESPREAD USE OF ORAL CONTRACEPTIVES OR OTHER MEANS OF INEXPENSIVE FERTILITY CONTROL. 12.7 PORNOGRAPHIC LITERATURE READILY AVAILABLE IN PAPERBACK EDITIONS.

SOCIAL AND TECHNICAL
IMPLICATIONS



BASIC, LONG-TERM TRENDS

IMPLICATIONS FOR EDUCATION

(CULTURAL SECTOR)
INCREASINGLY SENSATE EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE.

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10.13 EDUCATION IN THE FUTURE WILL BE INCREASINGLY CONCERNED WITH PRACTICAL PROBLEMS AND INTERACTIVE WITH THE ON-GOING SCIENTIFIC AND RESEARCH ENTERPRISE.

10.14 MANAGERS AND ADMINISTRATORS WILL HAVE TO BE EDUCATED IN THE SCIENCES AND HUMANITIES; WHILE SCIENTISTS WILL HAVE TO BE EDUCATED IN MANAGEMENT AND THE HUMANITIES; HUMANISTS WILL HAVE TO BE EDUCATED IN SCIENCE.

10.15 HEAVY EMPHASIS ON SCIENCE AND TECHNOLOGY IN THE EDUCATION OF FUTURE EDUCATORS.

10.16 WIDE APPLICATION OF THE CONCEPT OF THE "UNIVERSITY SEMINAR" IN WHICH SPECIALISTS FROM VARIED FIELDS FOCUS ON A SINGLE PROBLEM.

10.17 INCREASING USE WILL BE MADE OF GROUP INTERACTION TO PRODUCE LEARNING, INDIVIDUAL GROWTH, AND THE RESOLUTION OF PROBLEMS WITHOUT BEST SOLUTIONS.

10.18 WIDER USE OF NEW TECHNIQUES: SIMULATION, GAMING, CONFRONTATION SESSIONS, T-GROUP, ETC.

10.19 POSSIBLE APPLICATION OF THE MILITARY CONCEPT OF "CROSS-TRAINING" TO PREVENT OVER-SPECIALIZATION AND "TRAINED INCAPACITY."

10.20 EDUCATIONAL ADMINISTRATORS (SCHOOL SUPERINTENDENTS) WILL REQUIRE BROADER BASED EDUCATION AND TRAINING TO PREPARE THEM ADEQUATELY FOR AN INCREASINGLY COMPLEX AND CHANGING WORLD.

10.21 THE "MANAGEMENT" OF EDUCATIO... FUTURE WILL ASSUME A MAGNITUDE... TO THAT OF THE LARGEST CONTEMP... INDUSTRIAL AND MILITARY ORGAN...

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11.15 SEMINARS ON VALUES TO ATTEMPT TO HEAL BREACH BETWEEN THE GENERATIONS.

11.16 DEVELOPMENT OF A COHERENT SYSTEM OF VALUES APPROPRIATE FOR A COMPLEX WORLD IN TRANSITION.

11.13 CREATION OF SPECIAL SCHOOLS FOR TREATMENT AND REHABILITATION OF SCHOOL-AGE DRUG ADDICTS.

11.14 CREATION OF SPECIAL SCHOOLS FOR JUVENILE DELINQUENTS, RUNAWAYS, DROPOUTS, ETC.

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12.21 CREATION OF SPECIAL SCHOOLS FOR PREGNANT TEENAGERS.

12.19 SEXUAL BEHAVIOR BECOMES AN IMPORTANT SUBJECT FOR THE LEARNING PROCESS.

12.20 COUNSELING ON SEXUAL BEHAVIOR AND PROBLEMS OF EARLY MARRIAGE REQUIRED.

12.22 SEXUAL BEHAVIOR AND BIRTH CONTROL BECOME BASIC COURSES IN ALL HIGH SCHOOLS AND JUNIOR COLLEGES.

12.23 THE NEED FOR EDUCATION IN SEX AT THE GRADE SCHOOL LEVEL.

THIS LINE LEADS TO ANOTHER ITEM

EDUCATIONAL FUNCTIONS

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10.22 PROFESSIONAL CO-EDUCATION IN GROUP SESSIONS TO PROVIDE CROSS-TRAINING IN SCIENCE, MANAGEMENT, AND THE HUMANITIES.

10.26 IDENTIFICATION AND DEFINITION OF PROBLEMS FOR GROUPS OF STUDENTS TO ATTACK.

10.28 ASSISTING STUDENTS WITH DIVERSE BACKGROUNDS AND SPECIALISTS TO WORK TOGETHER ON A COMMON PROBLEM.

10.23 TRAINING OF EDUCATORS IN THE USE OF CONFRONTATION SESSIONS, T-GROUP, SENSITIVITY TRAINING, GROUP DYNAMICS, ETC.

10.27 DESIGN AND DEVELOPMENT OF SIMULATIONS AND GAMES FOR BOTH EDUCATORS AND STUDENTS.

10.29 CONDUCT BY EDUCATORS OF CONFRONTATION SESSIONS, T-GROUPS, SENSITIVITY TRAINING.

10.24 TRAINING IN ADMINISTRATION AND MANAGEMENT FOR EDUCATORS COMPARABLE TO THE HIGHEST LEVEL OF ADMINISTRATIVE ED. IN INDUSTRY.

10.25 SPECIAL INSTRUCTION IN SCIENCE AND TECHNOLOGY FOR FUTURE EDUCATORS.

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11.17 DEVELOPMENT OF TECHNIQUES AND SKILLS FOR TRANSMISSION AND SHARING OF VALUES.

11.20 INCULCATION AT ALL EDUCATIONAL LEVELS OF A NEW INTEGRATION OF VALUES.

11.18 MANAGEMENT AND SUPERVISION OF SCHOOLS FOR TREATMENT AND REHABILITATION OF SCHOOL-AGE DRUG ADDICTS.

11.19 MANAGEMENT AND SUPERVISION OF SCHOOLS FOR DELINQUENTS, DROPOUTS, RUNAWAYS, ETC.

11.21 TRAINING OF EDUCATORS FOR TEACHING FUNCTIONS IN SPECIAL SCHOOLS.

11.22 DEVELOPMENT OF CURRICULA AND EDUCATIONAL PROGRAMS FOR SPECIAL SCHOOLS.

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12.24 MANAGEMENT AND SUPERVISION OF SCHOOLS FOR PREGNANT STUDENTS.

12.25 GROUP DISCUSSIONS AND SEMINARS ON SEXUAL BEHAVIOR, BIRTH CONTROL, MARRIAGE AND THE FAMILY, VENEREAL DISEASE.

12.27 COUNSELING STUDENTS ON SEXUAL BEHAVIOR AND MARITAL PROBLEMS.

12.26 COORDINATION OF PARENTAL AND EDUCATOR ATTITUDES TOWARD TREATMENT OF SEXUAL EDUCATION, BIRTH CONTROL, DRESS.

BASIC, LONG-TERM TRENDS

POSSIBLE FUTURE ROLES

(CULTURAL SECTOR)

INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE.

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10.30 PROBLEM FORMULATORS - THOSE WHO IDENTIFY AND DEFINE RELEVANT RESEARCH AND OTHER TYPES OF PROBLEMS FOR ADVANCED LEARNERS TO ATTACK EITHER AS INDIVIDUALS OR IN GROUPS.

10.31 GROUP LEADERS - THOSE WHO CONDUCT LEARNING GAMES, SIMULATIONS, SENSITIVITY SESSIONS, CONFRONTATION GROUPS, INTERDISCIPLINARY LEARNING AND PROBLEM SOLVING SESSIONS, ETC.

10.32 ADMINISTRATORS IN EDUCATION - THOSE EDUCATORS TRAINED COMPARABLY TO THE HIGHEST LEVELS IN INDUSTRY AND GOVT.

10.33 SIMULATION AND GAMING DESIGNERS AND DEVELOPERS - THOSE WHO CREATE VARIOUS TYPES OF SIMULATIONS AND GAMES USED FOR EDUCATIONAL PURPOSES.

10.34 SIMULATION AND GAMING OPERATORS - THOSE WHO VARIOUS TYPES OF EDUCATIONAL SIMULATIONS AND

11

11.23 PROFESSORS OF VALUES - THOSE PROFESSORS WHOSE PRIMARY CONCERN IS INTEGRATION AND TRANSMISSION OF NEW VALUES.

11.24 SPECIAL MANAGERS AND SUPERVISORS - THOSE WHO MANAGE AND SUPERVISE SCHOOLS FOR TREATMENT AND REHABILITATION OF SCHOOL-AGE DRUG ADDICTS.

11.25 SPECIAL MANAGERS AND SUPERVISORS - THOSE WHO MANAGE AND SUPERVISE SCHOOLS FOR DELINQUENTS, DROPOUTS, RUNAWAYS, ETC.

11.26 DESIGNERS OF CURRICULA AND EDUCATIONAL PROGRAMS FOR SPECIAL SCHOOLS.

11.27 SPECIAL INSTRUCTORS - THOSE TEACHERS WITH UNIQUE TRAINING WHO WORK IN SPECIAL SCHOOLS, FOCUS IS ON HUMAN RELATIONS, NOT SUBJECT MATTER.

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12.28 SPECIAL MANAGERS AND SUPERVISORS - THOSE WHO MANAGE AND SUPERVISE SCHOOLS FOR PREGNANT STUDENTS.

12.29 MORES COORDINATORS - THOSE WHO WORK WITH STUDENTS AND PARENTS TO ATTEMPT TO ACHIEVE CONSENSUS RE; SEX EDUCATION, BIRTH CONTROL, DRESS, ETC.

12.30 SPECIAL COUNSELORS - THOSE WHO ADVISE YOUTH ON SEXUAL BEHAVIOR AND EARLY MARRIAGE.

12.31 GROUP LEADERS - THOSE WHO LEAD SEMINARS AND GROUP DISCUSSIONS ON SEXUAL BEHAVIOR, BIRTH CONTROL, MARRIAGE AND THE FAMILY, VENEREAL DISEASE, JUVENILE DELINQUENCY, ETC.

MAJOR ISSUES

OSE WHO RUN
ONS AND GAMES

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10.35
HOW CAN AN EDUCATIONAL SYSTEM BE DESIGNED TO PRODUCE BOTH GENERALISTS AND SPECIALISTS?

10.36
IF EXISTING EDUCATIONAL INSTITUTIONS ARE RESISTANT TO CHANGE, SHOULD NEW INSTITUTIONS BE CREATED TO REPLACE THEM AND STAFFED WITH NEW TYPES OF EDUCATORS?

10.37
WILL THE ADMINISTRATIVE FUNCTION IN THE EDUCATION OF THE FUTURE BE DIFFERENT THAN OTHER TYPES OF ADMINISTRATION?

10.40
HOW SHALL PERSONNEL FOR NEW TYPES OF ROLES IN EDUCATION BE ACQUIRED - BY TRAINING EXISTING EDUCATORS OR HIRING NEW TYPES FROM OUTSIDE EDUCATION?

10.39
HOW CAN NEW SUBJECTS AND METHODS BE PROVIDED TO NEW TEACHERS IN TEACHER'S COLLEGES BY "OLD" TEACHERS TRAINED AND STEEPED IN OLD SUBJECTS AND METHODS?

10.38
HOW, WHERE, AND BY WHOM SHALL ADMINISTRATORS IN EDUCATION BE TRAINED IN MODERN MANAGEMENT?

10.43
WHAT ARE THE REQUIREMENTS FOR AND POSSIBLE COSTS OF TEACHER AND ADMINISTRATOR RE-EDUCATION? IS IT DESIRABLE TO CONCENTRATE ONLY ON THE NEW CROP OF TRAINEES?

10.41
SHOULD EDUCATIONAL ADMINISTRATORS BE TRAINED IN THE SAME MANAGEMENT SCHOOLS AS MANAGERS FOR INDUSTRY?

10.42
SHOULD EDUCATORS ALLOW EDUCATION TO BECOME A HUGE MANAGERIAL ENTERPRISE OR SHOULD THEY ORGANIZE IT INTO RELATIVELY SMALL MANAGEABLE UNITS?

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11.28
IS IT THE RESPONSIBILITY OF EDUCATORS TO FORMULATE NEW VALUES? TO INTEGRATE THEM? TO TEACH THEM? IF YES, HOW?

11.29
IS IT THE RESPONSIBILITY OF THE EDUCATIONAL SYSTEM TO OPERATE SPECIAL SCHOOLS FOR DRUG ADDICTS, DROPOUTS, RUNAWAYS, PREGNANT GIRLS?

11.31
IS IT THE RESPONSIBILITY OF EDUCATORS TO MEDIATE CONFLICTS BETWEEN THE GENERATIONS?

11.30
SHOULD IT BE THE RESPONSIBILITY OF EDUCATORS TO COPE WITH MANIFESTATIONS OF SOCIAL DISORGANIZATION OR "ANOMIE"?

12

12.32
SHOULD EDUCATORS ACCEPT THE IDEA OR PHILOSOPHY OF PERMISSIVENESS IN THE EDUCATIONAL REALM OR OPPOSE IT? NOW DO EDUCATORS RECONCILE PERMISSIVENESS WITH THE NEED FOR DISCIPLINE AND HARD WORK?

12.33
WHAT POSITION SHALL EDUCATION TAKE WITH RESPECT TO BASIC CHANGES IN MORAL CODES?

12.34
IS IT THE RESPONSIBILITY OF THE EDUCATIONAL SYSTEM TO DETERMINE, IMPOSE, AND MONITOR CHANGING STYLES OF YOUTH BEHAVIOR, DRESS, SEXUAL BEHAVIOR?

12.35
IS A FREER AND FRANKER APPROACH TO SEX ISSUES MORE OF LESS HEALTHY IN EDUCATIONAL ENVIRONMENTS? AT WHAT LEVEL?

12.36
ARE EDUCATORS PREPARED TO ACCEPT THE CONSEQUENCES OF MORE OPEN DISCUSSION OF SEX WITH CHILDREN? WHAT ARE THE POSSIBLE CONSEQUENCES?

BASIC, LONG-TERM TRENDS	MAJOR SUB-TRENDS
4.0 RISING ASPIRATIONS OF DISADVANTAGED	4 — 4.1 TREND TOWARD HIGHER ASPIRATIONS AMONG THE DISADVANTAGED PORTIONS OF THE POPULATION. → 4.2 THERE WILL BE A MAJOR SHIFT IN CLASS-RELATED VALUES IN WHICH THE LOWER-CLASS WILL BECOME "STRIVERS".
5.0 URBANIZATION	5 — 5.1 TREND TOWARD URBANIZATION CONTINUES WITH THE GROWTH OF MEGALOPOLISES. → 5.2 URBAN LIFE BECOMES INCREASINGLY UGLY, NOISY, DISORGANIZED, UNSAFE FROM TRAFFIC, CRIME, AND POLLUTANTS. → 5.6 MAJOR EFFORTS ARE UNDERTAKEN TO SALVAGE AND REBUILD URBAN CENTERS.
	5.3 THE MIDDLE-CLASS CONTINUES THE FLIGHT TO THE SUBURBS AND JOINED BY UPPER-LOWER CLASS WITH INCREASING AFFLUENCE.
	5.4 NEGROES WILL COMPRISE AN INCREASING PROPORTION OF THE POPULATION IN URBAN CORE AREAS (GHETTOS) → 5.7 TREND TOWARD INCREASING VIOLENCE IN URBAN GHETTOS. → 5.8 WHITE BACKLASH AGAINST NEGRO POLITICAL ACTIONS, BLACK POWER ADVOCATES, ETC., RESULTS IN MUCH POLITICAL CONTROVERSY IN BIG CITIES.
	5.5 RAPID INCREASE IN NEGRO PARTICIPATION IN POLITICAL ACTIVITIES; BLACK POWER MOVEMENTS; BLACK NATIONALIST GROUPS. → 5.9 NEGROES GAIN POLITICAL CONTROL OF SEVERAL OF THE LARGEST CITIES IN THE NATION.
(SOCIO-CULTURAL SECTOR) INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE.	
6.0 CHANGING ASPIRATIONS OF MIDDLE CLASS	6 — 6.1 INCREASING AFFLUENCE IN THE MIDDLE-CLASS UNDERMINES TRADITIONAL CONCERNS FOR ACHIEVEMENT/ADVANCEMENT/CAREERS. → 6.2 THE CHILDREN OF THE MIDDLE-CLASS WILL EXPERIENCE AN EROSION OF WORK-ORIENTED, ACHIEVEMENT-ORIENTED VALUES. → 6.4 TREND TOWARD AN INCREASING DECLINE IN THE NUMBER OF YOUNG PEOPLE INTERESTED IN CAREERS IN BUSINESS AND INDUSTRY.
	6.3 ALIENATION(?)

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SOCIAL AND TECHNICAL
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4.3
4 INCREASING SPECIALIZATION IN NARROWLY DEFINED TASKS WILL REMAIN AS A BASIS FOR THE SOCIAL MOBILITY OF "STRIVERS" IN THE LOWER-CLASS--NEGROES AND OTHERS.

4.4
MAJOR SEGMENTS OF THE POPULATION, INCLUDING WOMEN, WILL EMPLOY AVAILABLE TIME TO EARN ADDITIONAL INCOME FOR THE PURCHASE OF NON-ESSENTIAL, LUXURY ITEMS.

5.13
RISING CRIME RATES

5.11
MAJOR EFFORTS SPONSORED BY FEDERAL AND STATE AUTHORITIES TO FIND JOBS FOR THOSE HANDICAPPED BY INABILITY TO WORK WITH SYMBOLS.

5.14
TREND TOWARD CENTRALIZATION OF POWER TO COPE WITH URBAN PROBLEMS AND TO CONTROL VIOLENCE.

5.10
5 THE CULTURALLY DISADVANTAGED WILL FIND THEMSELVES INCREASINGLY DISADVANTAGED IN A WORLD CHARACTERIZED BY SYMBOL MANIPULATION.

5.12
THERE WILL BE VARIOUS TYPES OF SOCIAL PROTEST AND REBELLION (USE OF DRUGS, DROP-OUTS, RIOTS, ANTI-ESTABLISHMENT MOVEMENTS, LITERATURE, ETC.)

5.15
TREND TOWARD "PARTICIPANT DEMOCRACY" TO INVOLVE STUDENTS AND OTHER DISSIDENT GROUPS IN DECISION MAKING.

6.6
THE USE OF DRUGS AND OTHER FORMS OF ESCAPIST ACTIVITIES INCREASE AMONG YOUTH OF URBAN GHETTOS AND AFFLUENT SUBURBS AND COLLEGES.

6.9
EMERGENCE OF AN EXTENSIVE UNDERGROUND MOVEMENT AND STUDENT SPONSORED "FREE" UNIVERSITIES IN MIDDLE-CLASS ENVIRONMENTS.

6.5
6 IDEA OF THE "TWO FAMILY FAMILY". (BEGIN SECOND FAMILY AFTER 40 IF AFFLUENT AND LONELY ENOUGH.)

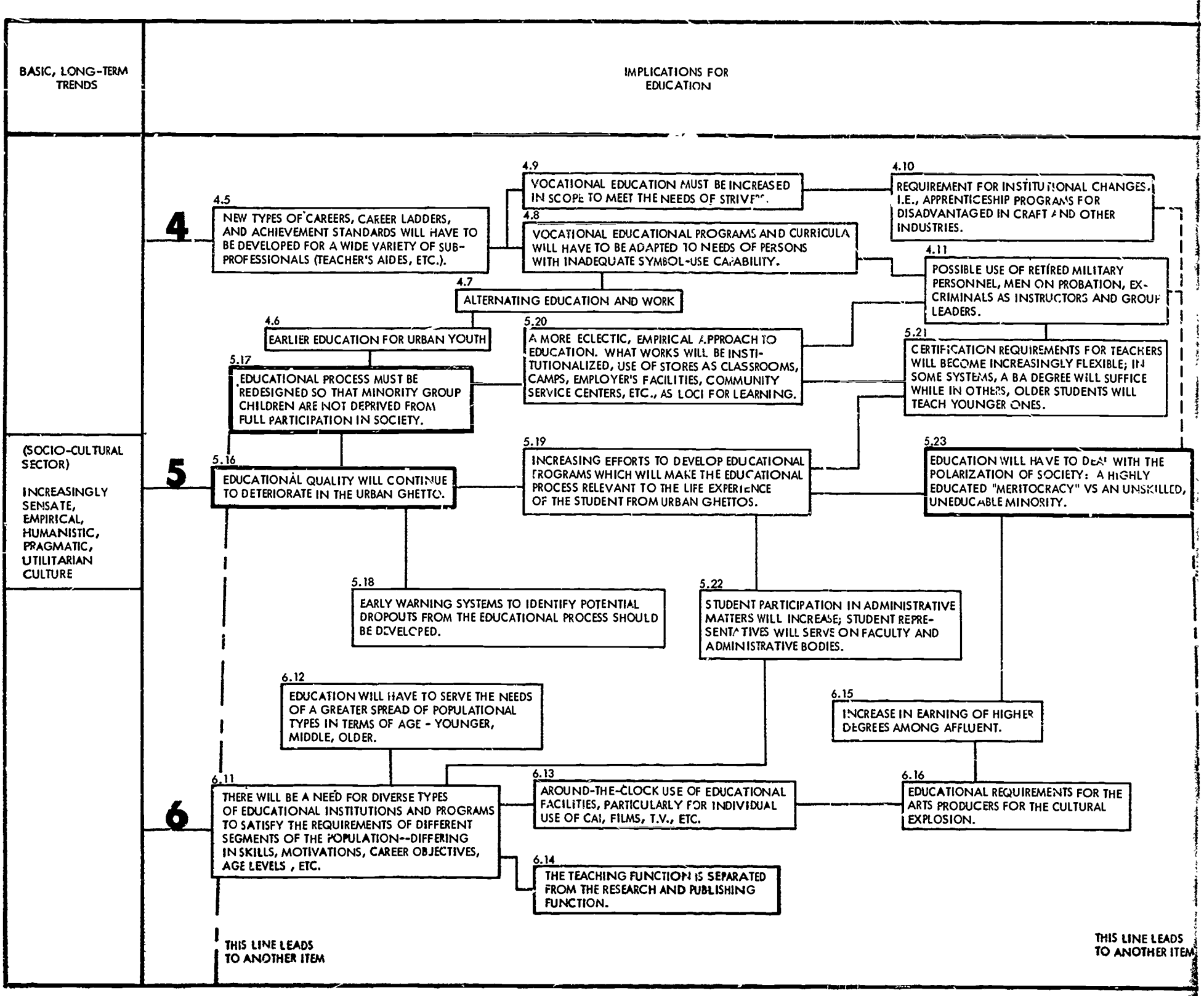
6.8
WITH INCREASING LEISURE, GREATER AFFLUENCE, AND TWO FAMILY FAMILY CONCEPT, POPULATION CONTINUES RAPID GROWTH.

6.10
A CULTURAL EXPLOSION.

6.7
INCREASE IN AVERAGE LONGEVITY.

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM


BASIC, LONG-TERM TRENDS
IMPLICATIONS FOR EDUCATION
(SOCIO-CULTURAL SECTOR)
INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE
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4.5 NEW TYPES OF CAREERS, CAREER LADDERS, AND ACHIEVEMENT STANDARDS WILL HAVE TO BE DEVELOPED FOR A WIDE VARIETY OF SUB-PROFESSIONALS (TEACHER'S AIDES, ETC.).
4.9 VOCATIONAL EDUCATION MUST BE INCREASED IN SCOPE TO MEET THE NEEDS OF STRIVE
4.10 REQUIREMENT FOR INSTITUTIONAL CHANGES, I.E., APPRENTICESHIP PROGRAMS FOR DISADVANTAGED IN CRAFT AND OTHER INDUSTRIES.
4.8 VOCATIONAL EDUCATIONAL PROGRAMS AND CURRICULA WILL HAVE TO BE ADAPTED TO NEEDS OF PERSONS WITH INADEQUATE SYMBOL-USE CAPABILITY.
4.11 POSSIBLE USE OF RETIRED MILITARY PERSONNEL, MEN ON PROBATION, EX-CRIMINALS AS INSTRUCTORS AND GROUP LEADERS.
4.7 ALTERNATING EDUCATION AND WORK
4.6 EARLIER EDUCATION FOR URBAN YOUTH
5.20 A MORE ECLECTIC, EMPIRICAL APPROACH TO EDUCATION. WHAT WORKS WILL BE INSTITUTIONALIZED, USE OF STORES AS CLASSROOMS, CAMPS, EMPLOYER'S FACILITIES, COMMUNITY SERVICE CENTERS, ETC., AS LOCI FOR LEARNING.
5.21 CERTIFICATION REQUIREMENTS FOR TEACHERS WILL BECOME INCREASINGLY FLEXIBLE; IN SOME SYSTEMS, A BA DEGREE WILL SUFFICE WHILE IN OTHERS, OLDER STUDENTS WILL TEACH YOUNGER ONES.
5.17 EDUCATIONAL PROCESS MUST BE REDESIGNED SO THAT MINORITY GROUP CHILDREN ARE NOT DEPRIVED FROM FULL PARTICIPATION IN SOCIETY.
5.16 EDUCATIONAL QUALITY WILL CONTINUE TO DETERIORATE IN THE URBAN GHETTO.
5.19 INCREASING EFFORTS TO DEVELOP EDUCATIONAL PROGRAMS WHICH WILL MAKE THE EDUCATIONAL PROCESS RELEVANT TO THE LIFE EXPERIENCE OF THE STUDENT FROM URBAN GHETTOS.
5.23 EDUCATION WILL HAVE TO DEAL WITH THE POLARIZATION OF SOCIETY: A HIGHLY EDUCATED "MERITOCRACY" VS AN UNSKILLED, UNEDUCABLE MINORITY.
5.18 EARLY WARNING SYSTEMS TO IDENTIFY POTENTIAL DROPOUTS FROM THE EDUCATIONAL PROCESS SHOULD BE DEVELOPED.
5.22 STUDENT PARTICIPATION IN ADMINISTRATIVE MATTERS WILL INCREASE; STUDENT REPRESENTATIVES WILL SERVE ON FACULTY AND ADMINISTRATIVE BODIES.
6.12 EDUCATION WILL HAVE TO SERVE THE NEEDS OF A GREATER SPREAD OF POPULATIONAL TYPES IN TERMS OF AGE - YOUNGER, MIDDLE, OLDER.
6.15 INCREASE IN EARNING OF HIGHER DEGREES AMONG AFFLUENT.
6.11 THERE WILL BE A NEED FOR DIVERSE TYPES OF EDUCATIONAL INSTITUTIONS AND PROGRAMS TO SATISFY THE REQUIREMENTS OF DIFFERENT SEGMENTS OF THE POPULATION--DIFFERING IN SKILLS, MOTIVATIONS, CAREER OBJECTIVES, AGE LEVELS, ETC.
6.13 AROUND-THE-CLOCK USE OF EDUCATIONAL FACILITIES, PARTICULARLY FOR INDIVIDUAL USE OF CAI, FILMS, T.V., ETC.
6.16 EDUCATIONAL REQUIREMENTS FOR THE ARTS PRODUCERS FOR THE CULTURAL EXPLOSION.
6.14 THE TEACHING FUNCTION IS SEPARATED FROM THE RESEARCH AND PUBLISHING FUNCTION.
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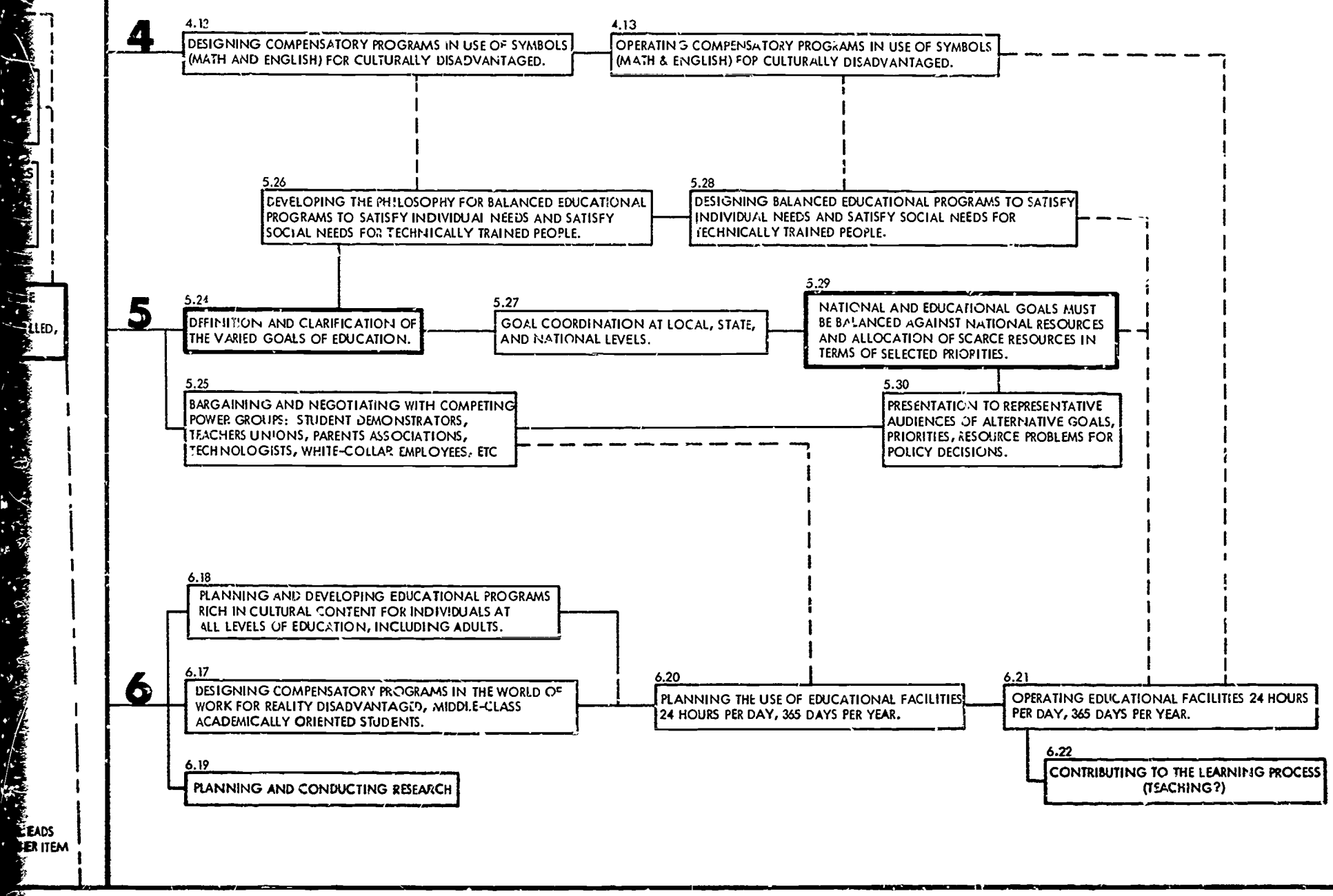
EDUCATIONAL FUNCTIONS



BASIC, LONG-TERM TRENDS	POSSIBLE FUTURE ROLES			
(SOCIO-CULTURAL SECTOR) INCREASINGLY SENSATE, EMPIRICAL, HUMANISTIC, PRAGMATIC, UTILITARIAN CULTURE	**4**	4.16 ONE-TO ONE TUTORS - THOSE WHO ASSIST IN THE EDUCATION AND GUIDANCE OF UNIQUE LEARNERS AT OPPOSITE ENDS OF THE CAPABILITY SPECTRUM - THE UNUSUALLY DISADVANTAGED AND THE UNUSUALLY GIFTED.	4.17 HIGH PERFORMANCE EDUCATORS - THOSE HIGHLY QUALIFIED TEACHERS TRAINED SPECIFICALLY TO FACILITATE LEARNING PROCESSES AMONG THE DISADVANTAGED IN URBAN GHETTO ENVIRONMENTS.	
		4.14 SPANNERS - THOSE WHO BRIDGE EDUCATIONAL GAPS BETWEEN TEACHERS AND STUDENTS, MORE ADVANCED AND LESS ADVANCED LEARNERS, I E , AN 8TH GRADE STUDENT TEACHING A 6TH GRADE STUDENT, OR THE EQUIVALENT OF GRADE LEVELS.	4.18 UNCREDENTIALED TEACHERS - THOSE WHO HAVE HAD APPROVED COLLEGE-LEVEL TRAINING ADEQUATE TO PROVIDE LEARNING ENVIRONMENTS AND PROCESSES FOR THE DISADVANTAGED IN URBAN GHETTO ENVIRONMENTS.	4.20 COLLEGE STUDENT ASSISTANTS - THOSE COLLEGE STUDENTS WHO WILL BE PAID MINIMAL SALARIES TO WORK WITH HIGH-SCHOOL LEVEL OR YOUNGER STUDENTS WHO REQUIRE COMPENSATORY PROGRAMS IN URBAN GHETTO ENVIRONMENTS.
		4.15 VOCATIONAL TRAINING/CAREER SPANNERS - THOSE WHO ASSIST VOCATIONAL EDUCATION STUDENTS BRIDGE THE GAP BETWEEN EDUCATION AND WORK	4.19 SUPERVISOR/TRAINERS - THOSE WHO PROVIDE BOTH SUPERVISION AND TRAINING FOR YOUNG PEOPLE IN ON-THE-JOB LEARNING SITUATIONS. (NOTE. THE IMPLICATION OF THIS ROLE IS AN ORGANIZATIONAL OVERLAP BETWEEN PRIVATE INDUSTRY AND THE FORMAL EDUCATIONAL SYSTEM.)	4.21 PSYCHIATRIC AIDES - THOSE PERSONNEL TRAINED IN PSYCHIATRY OR CLINICAL PSYCHOLOGY WHO ASSIST EDUCATORS WITH PUPILS SUFFERING FROM PSYCHOLOGICAL OBSTACLES TO LEARNING.
	5	5.31 EDUCATIONAL FUTURISTS - THOSE WHO SYSTEMATICALLY EXPLORE THE IMPLICATIONS OF CONJECTURES ABOUT THE FUTURE FOR EDUCATIONAL PURPOSES.	5.33 EDUCATION ARCHITECTS - THOSE WHO DESIGN THE FACILITIES, PLANTS, EDIFICES, ETC., IN WHICH INDIVIDUAL, GROUP, AND COMMUNITY-WIDE LEARNING EXPERIENCES CAN OCCUR.	5.35 TECHNICAL ASSISTANTS - THOSE WHO ASSIST IN THE LEARNING PROCESS BY PROVIDING SPECIALIZED KNOWLEDGE IN THE USE OF EQUIPMENT WHICH CONVEYS INFORMATION SUCH AS AUDIOVISUAL AIDS, FILMSTRIPS, PROGRAMMED INSTRUCTION, ETC.
		5.32 COMMUNITY REPRESENTATIVE - THOSE PERSONS CHOSEN BY THE LOCAL COMMUNITY TO REPRESENT THE COMMUNITY IN MEETINGS AND CONFERENCES WITH THE LOCAL EDUCATORS.	5.34 GUIDANCE COUNSELORS - THOSE WHO ASSIST ACADEMICALLY-ORIENTED STUDENTS WITH EDUCATIONAL PLANS, AND JOB-ORIENTED STUDENTS WITH NEEDED QUALIFICATIONS AND TRAINING FOR JOB GOALS.	6.26 PROGRAM EVALUATORS - THOSE WHO EVALUATE NON-FORMAL, WORK-ORIENTED, OR COMMUNITY ACTIVITIES FOR THEIR CONTRIBUTIONS TO A STUDENT'S EDUCATIONAL GOALS AND EDUCATIONAL STANDING (ACCREDITATION).
	6	6.23 MASTER TEACHER - THOSE HIGHLY QUALIFIED EDUCATORS WHO LEAD TEACHING TEAMS AND SUPERVISE UNCREDENTIALED TEACHERS, ASSISTANT TEACHERS, STUDENT TEACHERS, TECHNICAL ASSISTANTS, ETC.	6.25 COMMUNITY EDUCATION COORDINATORS - THOSE WHO PLAN, COORDINATE, AND MANAGE MULTIPLE AND DIVERSE EDUCATIONAL PROGRAMS SERVING A COMMUNITY IN THE LOCAL SCHOOL OR AN EQUIVALENT LEARNING ENVIRONMENT.	6.27 COMMUNITY CURRICULUM DESIGNERS - THOSE WHO DEVELOP ON-THE-JOB, COMMUNITY ACTION, APPRENTICESHIP, AND OTHER TYPES OF LEARNING EXPERIENCES WHICH OCCUR OUTSIDE OF FORMAL EDUCATIONAL INSTITUTIONS.
		6.24 STUDENT TEACHERS - THOSE STUDENTS ACQUIRING A BACCALAUREATE DEGREE WITH THE GOAL OF BECOMING PROFESSIONAL TEACHERS WHO ASSIST THE LEARNING PROCESS UNDER THE DIRECTION OF PROFESSIONALS. (NOTE: THIS ROLE IS NOT LIMITED TO A "TEACHER'S COLLEGE" - ANY LIBERAL ARTS STUDENT WOULD BE ELIGIBLE.)		6.28 CREDENTIALS EXPERTS - THOSE WHO HAVE THE TRAINING AND OFFICIAL AUTHORITY TO TRANSLATE WIDE VARIETIES OF WORK AND LEARNING EXPERIENCES INTO FORMALLY ACCEPTABLE CRITERIA FOR INDIVIDUAL PROGRESSION, AWARD OF CERTIFICATES, GRADUATION, ETC.

MAJOR ISSUES

4

4.22 HOW SHALL EDUCATION IN THE 1980'S BE ORGANIZED TO ACCOMODATE VOCATIONALLY-ORIENTED STUDENTS AND ACADEMICALLY-ORIENTED STUDENTS? SHOULD VOCATIONAL EDUCATION BE BASED ON A POLICY OF "SEPARATISM" OR "APARTHEID"? HOW CAN A NEW EMPHASIS ON VOCATIONAL TRAINING BE RECONCILED WITH RAPID JOB OBSOLESCENCE?

4.23 HOW CAN THE NEED OF "STRIVERS" FROM THE URBAN GHETTOS FOR JOBS BE RECONCILED WITH THE GOAL OF "TEACHING STUDENTS HOW TO LEARN"?

4.24 SHOULD EDUCATION CONTRIBUTE TO THE POLARIZATION OF SOCIETY BY CATERING TO THE NEEDS OF URBAN GHETTO "STRIVERS" FOR JOBS AND THE NEEDS OF THE AFFLUENT FOR "CULTURE" AND INDIVIDUAL SELF-FULFILLMENT?

4.25 IS THE CURRENT EDUCATIONAL SYSTEM CAPABLE OF MOUNTING MASSIVE ATTACKS ON SUCH PROBLEMS AS EDUCATING THE GHETTO ILLITERATES, ADULT ILLITERATES, MAKING THE DISADVANTAGED EMPLOYABLE, ETC.?

4.26 SHOULD EXISTING TEACHERS' COLLEGES BE ADAPTED TO NEW NEEDS [illegible] TRAINING OR SHOULD ENTIRELY NEW INSTITUTI[illegible] BE BUILT?

5.34 IS THE GOAL OF LEARNING: THE TRANSMISSION OF KNOWLEDGE? INDIVIDUAL SELF-FULFILLMENT? AIDING THE ACHIEVEMENT OF SOCIAL ENDS? ALL OF THESE? SOME OF THESE? WHICH? WHAT PRIORITIES ARE THERE?

5

5.37 IF EDUCATION IS CONDUCTED BY A WIDE VARIETY OF INSTITUTIONS NOT DIRECTLY CONTROLLED BY PROFESSIONAL EDUCATORS, HOW CAN THE RESULTS BE MONITORED, MEASURED, EVALUATED, AND CHANGED?

5.38 SHOULD STUDENTS AND FACULTY PARTICIPATE IN ADMINISTRATIVE OR OTHER DECISIONS AFFECTING THE PRACTICE OF EDUCATION? AT WHAT EDUCATIONAL LEVELS?

5.39 CAN THE QUALITY OF EDUCATION BE MAINTAINED IF STUDENTS AND MEMBERS OF THE LOCAL COMMUNITY PARTICIPATE IN THE ADMINISTRATION OF EDUCATIONAL FACILITIES?

5.40 HOW CAN THE GLARING INCONSISTENCY BETWEEN THE BUREAUCRATIC NATURE OF CURRENT EDUCATIONAL INSTITUTIONS AND BEHAVIORAL CONCEPTS OF INDIVIDUAL FULFILLMENT, GROUP DYNAMICS, PARTICIPANT DEMOCRACY, AND INDIVIDUAL LEARNING BE RESOLVED?

5.41 HOW CAN NEW ADVANCES IN EDUCATION BE SOLD TO THE PUBLIC WHICH DOES NOT UNDERSTAND THEM? HOW WILL THIS AFFECT EDUCATIONAL FINANCING?

6

6.29 SHOULD CURRICU[illegible] BUILT AROUND SOCIAL ISSUES AND PROB[illegible] OR AROUND TRADITIONAL DISCIPLINES AND SPECIALISTS? SHOULD THIS ISSUE BE APPROACHED IN TERMS OF LEVEL OF EDUCATION?

6.30 SHOULD ACADEMIC INSTITUTIONS BE DESIGNED AS ISOLATED INTELLECTUAL COMMUNITIES OR AS INTEGRATED ELEMENTS OF LOCAL COMMUNITIES?

6.31 HOW CAN EDUCATIONAL PLANNERS COPE WITH SUCH PHENOMENA AS INCREASING LEISURE-TIME AND THE "CULTURAL EXPLOSION?" IS THIS A RESPONSIBILITY OF PUBLIC EDUCATION?

6.32 SHOULD THE EXPANSION OF EDUCATIONAL CAPABILITY BE VIEWED AS A NEED FOR MORE STAFF, IMPROVED USE OF TECHNOLOGY, OR BOTH? IF BOTH, IN WHAT MIX?

BASIC, LONG-TERM TRENDS	MAJOR SUB-TRENDS
7.0 OCCUPATIONAL CHANGES	7
8.0 CONTROLLED ECONOMY	8
(ECONOMIC SECTOR-NATIONAL) TRANSITIONAL, MASS CONSUMPTION SOCIETY CHARACTERIZED BY HIGHER GNP AND PERSONAL INCOMES, AFFLUENCE (AMONG BETTER EDUCATED).	
9.0 SOCIAL GROWTH INDICATORS	9

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

7.1 THERE WILL BE A CONTINUING SHIFT IN THE NATURE OF WORK FROM PRIMARY TO SECONDARY TO TERTIARY TYPES OF OCCUPATIONS PERFORMED BY MOST PEOPLE.

7.2 THERE WILL BE AN INCREASING CAPABILITY TO PRODUCE MORE MATERIAL THINGS WITH LESS HUMAN EFFORT (MAN-HOURS OF LABOR).

7.3 CONTINUING TREND TOWARD REDUCTION OF NEED FOR BLUE-COLLAR PRODUCTION WORKERS IN INDUSTRY.

7.4 THERE WILL BE RAPIDLY EXPANDING JOB OPPORTUNITIES IN RECREATION, HEALTH, AND EDUCATION FIELDS.

7.5 CONTINUING TREND TOWARD GREATER AGRICULTURAL PRODUCTIVITY WITH FEWER MAN-HOURS OF LABOR.

7.6 EDUCATION BECOMES A MAJOR GROWTH INDUSTRY.

7.7 WHILE THE REQUIREMENT FOR AGRICULTURAL EDUCATION WILL DECLINE IN THE DEVELOPED COUNTRIES, IT WILL INCREASE IN THE UNDEVELOPED, HAVE-NOT COUNTRIES.

7.8 INDUSTRY INVADES THE FIELD OF EDUCATION FOR PROFIT.

8.1 A SOCIETY TRANSITIONAL BETWEEN INDUSTRIAL AND "POST-INDUSTRIAL" - DECLINE OF THE AUTHORITY OF THE MARKET; A PLANNED ECONOMY.

8.2 TECHNICAL INNOVATION REGARDED AS ESSENTIAL TO ENSURE ECONOMIC GROWTH.

8.3 TYPICAL ECONOMIC ENTERPRISE REQUIRES CAPITAL, ADVANCED TECHNOLOGY, AND COMPLEX ORGANIZATION.

8.4 INCREASING CAPITAL INVESTMENT IN COMPUTERS USED FOR AUTOMATED PROCESS CONTROL IN BUSINESS, COMMERCE, AND INDUSTRY.

8.5 CONTINUING TREND TOWARD MERGING OF MORE GIGANTIC INDUSTRIAL FIRMS AND CONGLOMERATES.

8.6 EXPANSION OF U. S. INDUSTRIAL GIANTS OVERSEAS.

8.7 FIVE TO SIX HUNDRED LARGE CORPORATIONS COMPRISE THE NEW "INDUSTRIAL STATE."

9.1 ECONOMIC GROWTH A PRIMARY SOCIAL AND CORPORATE OBJECTIVE. (THE GNP IS THE MEASURE OF GROWTH.)

9.2 RESEARCH ON ECONOMIC AND SOCIAL INDICATORS OF NATIONAL GROWTH.

9.3 INCREASING CONCERN WITH THE QUALITY OF LIFE IN A MASS PRODUCTION AND MASS CONSUMPTION SOCIETY.

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SOCIAL AND TECHNICAL IMPLICATIONS

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7.9 AVERAGE NUMBER OF HOURS WORKED PER WEEK REDUCED FROM 40 TO 35 IN SOME INDUSTRIES AND 30 IN OTHERS.

7.12 INCREASE IN THE NUMBER OF NATIONAL HOLIDAYS PER YEAR.

7.13 AVERAGE WEEKLY HOURS OF WORK DOWN TO 30-35 HOURS BY 1988.

7.15 MAJOR SEGMENTS OF THE POPULATION WILL HAVE INCREASING AMOUNTS OF LEISURE TIME.

7.11 VOLUNTARY RETIREMENT AT AGE 55; MANDATORY RETIREMENT AT AGE 60.

7.10 GRADUAL INCREASE IN THE RATE OF UNEMPLOYMENT TO 10 PER CENT AND POSSIBLY HIGHER IF NO WARS.

7.14 INCREASING PARTICIPATION OF THE FEDERAL GOVT AND INDUSTRY IN JOB CORPS AND OTHER TYPES OF TRAINING PROGRAMS.

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8.8 HUGE INVESTMENTS IN CAPITAL, RESOURCES, MANPOWER, TIME, REQUIRE GREATER CONTROL OVER THE COURSE OF FUTURE EVENTS.

8.10 THERE IS AN INCREASING TREND TOWARD THE MIXING OF PUBLIC AND PRIVATE ENTERPRISE.

8.12 NATIONAL PLANNING BECOMES THE PRACTICE IF NOT THE IDEAL OF AMERICAN BEHAVIOR.

8.14 A GNP OF APPROXIMATELY 1,500 BILLION DOLLARS BY THE 1980's.

8.9 THE STATE INCREASINGLY ABSORBS THE RISKS OF PRIVATE ENTERPRISE.

8.11 THERE WILL BE AN INCREASING NUMBER OF PUBLIC RATHER THAN PRIVATE INSTITUTIONS ATTEMPTING TO SOLVE PROBLEMS WHICH PRIVATE ENTERPRISE WILL NOT OR CANNOT.

8.13 RITUALISTIC APPEALS TO "INDIVIDUALISM" AND "COMPETITION" CONTINUE IN THE CONTEXT OF AN INCREASINGLY COOPERATIVE SOCIETY.

8.15 ECONOMIC PLANNING INVOLVES INEVITABLY SOME CONTROL OVER INDIVIDUAL BEHAVIOR.

9.8 UNDER CONDITIONS OF AFFLUENCE, THE BETTER EDUCATED REQUIRE WORK TO HAVE A SENSE OF HIGH PURPOSE OR MISSION.

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9.4 RECOGNITION BY ECONOMISTS THAT EDUCATION, IN ADDITION TO LABOR AND CAPITAL, CONTRIBUTES TO ECONOMIC GROWTH OF NATIONS.

9.5 INVESTMENT IN HUMAN RESOURCES OR HUMAN CAPITAL (HUMAN BEINGS) BECOMES A MAJOR OPERATIONAL OBJECTIVE OF FEDERAL POLICY.

9.7 GRADUAL ACCEPTANCE OF "CULTURAL QUALITY" AS A MEASURE OF SOCIAL PROGRESS IN ADDITION TO ECONOMIC GROWTH.

9.6 INCREASING RECOGNITION OF NATIONAL RESPONSIBILITY FOR CULTURAL AS WELL AS ECONOMIC DEVELOPMENT AND GROWTH.

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BASIC, LONG-TERM TRENDS

IMPLICATIONS FOR EDUCATION

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7.17 POSSIBLE RETRAINING OF DISPLACED U. S AGRICULTURAL WORKERS TO SERVE OVERSEA' IN AN INTERNATIONAL PEACE CORPS.

7.16 NEW TYPES OF EDUCATIONAL PROGRAMS, AND PERHAPS INSTITUTIONS, WILL BE NEEDED TO TRAIN PEOPLE FOR JOBS IN THE SERVICE INDUSTRIES.

7.19 LARGE-SCALE TEACHER SHORTAGES WILL REQUIRE ALTERNATIVE SOLUTIONS.

7.21 PRIVATELY DESIGNED AND OPERATED EDUCATIONAL SYSTEMS AND PROGRAMS BOTH IN THE U. S. AND ABROAD.

7.18 NEED FOR CRASH PROGRAMS TO PREPARE DISADVANTAGED FOR EMPLOYMENT AND TRAINING IN SERVICE FIELDS.

7.20 DEVELOPMENT OF SUB-PROFESSIONAL CAREER LADDERS.

7.22 INDUSTRIAL FIRMS GIVE POST-DOCTORAL FELLOWSHIPS AND PROGRAMS LEADING TO THE PH.D. PROVIDE UNIVERSITY INSTRUCTION, RESEARCH LEADERSHIP; ETC.

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(ECONOMIC SECTOR-NATIONAL)

TRANSITIONAL, MASS CONSUMPTION SOCIETY CHARACTERIZED BY HIGHER GNP AND PERSONAL INCOMES, AFFLUENCE (AMONG BETTER EDUCATED).

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8.17 10 PER CENT OF GNP (1,500 BILLION DOLLARS) OR 150 BILLIONS DEVOTED TO EDUCATION IN 1986.

8.19 INCREASING GAP AMONG THE STATES IN EXPENDITURES PER STUDENT FOR EDUCATION.

8.21 FINANCIAL ASSISTANCE TO POOR FROM FEDERAL AND PRIVATE SOU

8.16 THE EDUCATIONAL SYSTEM WILL BE EXPECTED TO PRODUCE THE TRAINED MANPOWER NEEDED FOR A HIGHLY COMPLEX, TECHNOLOGICAL SOCIETY.

8.18 UNIVERSAL AND FREE JUNIOR COLLEGE LEVEL EDUCATION BECOMES MANDATORY IN THE U. S. ACADEMIC COLLEGE OR VOCATIONAL TRAINING ALSO FREE, UNIVERSAL BUT OPTIONAL BEYOND JUNIOR COLLEGE LEVEL.

8.20 UNIVERSAL AND FREE COLLEGE-LEV EDUCATION BECOMES OPTIONAL IN

8.22 EDUCATIONAL EXPENDITURES WILL TO GROW FASTER THAN OUR NATIO OUTPUT OF GOODS AND SERVICE

9.10 INCREASING PRESSURES ON EDUCATION TO CONTRIBUTE TO THE DEVELOPMENT OF THE NATIONAL RESOURCE OF "HUMAN CAPITAL."

9.16 QUANTITATIVE MODELS OF THE TOTAL E SYSTEM WILL BE NEEDED FOR EVALUATIO PLANNING PURPOSES.

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9

9.9 MASSIVE CONTRIBUTIONS TO EDUCATION (IN THE ABSENCE OF WAR) BY PUBLIC AND PRIVATE SOURCES TO AID ECONOMIC GROWTH AND CULTURAL QUALITY.

9.12 DEVELOPMENT OF EDUCATIONAL SYSTEMS RELEVANT TO ATTAINMENT OF NATIONAL GOALS.

9.14 THERE WILL BE A NEED FOR DATA WHICH DESCRIBE THE ATTRIBUTES OF THE TOTAL EDUCATIONAL SYSTEM.

9.11 INCREASING PRESSURES BY NATIONAL AND CORPORATE ECONOMIC GOALS FOR CONFORMITY ON THE EDUCATIONAL SYSTEM.

9.13 NEW QUANTITATIVE INDICATORS ARE NEEDED TO EVALUATE THE ATTAINMENT OF NATIONAL GOALS BY THE TOTAL EDUCATIONAL SYSTEM.

9.15 DATA DESCRIBING THE ATTRIBUTES EDUCATIONAL SYSTEM MUST BE ID ACQUIRED ON A REGULAR BASIS.

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7.23 ENLARGEMENT OF EDUCATIONAL SYSTEM FOR AVOCATIONAL STUDIES.

7.24 PLANNING AND CARRYING OUT A MAJOR RE-ORIENTATION IN EDUCATIONAL SUPPORT FROM PRIMARY TO SECONDARY TO TERTIARY OCCUPATIONS IN VOCATIONAL EDUCATION.

7.25 COOPERATION WITH INDUSTRY IN THE DEVELOPMENT OF NEW EDUCATIONAL PROGRAMS.

7.26 RETRAINING OF DISPLACED AGRICULTURAL WORKERS FOR JOBS OVERSEAS.

7.27 PLANNING EDUCATIONAL PROGRAMS FOR SERVICE OCCUPATIONS, PREPARATION OF CURRICULA, TRAINING OF TEACHERS, ETC.

7.28 OPERATION OF JOB CORPS, EDUCATIONAL CAMPS, AND OTHER INDUSTRY-SUPPORTED ED. PROGRAMS.

8.23 DESIGN AND DEVELOPMENT OF COMPUTERIZED MAN-JOB MATCHING SYSTEMS.

8.24 PLANNING AND COORDINATION OF PRIVATE AND PUBLIC EDUCATIONAL PROGRAMS.

8.25 DEVELOPING A SOCIAL IDEOLOGY THAT RECONCILES INCREASED PLANNING AND CONTROL OVER THE ECONOMY WITH TRADITIONAL CONCEPTS OF INDIVIDUALISM AND FREEDOM.

8.26 MEASURING AND EVALUATING BALANCE IN EDUCATION BETWEEN MEETING INDIVIDUAL NEEDS AND SOCIAL REQUIREMENTS FOR SKILLED PEOPLE.

8.27 MASSIVE RECRUITMENT AND TRAINING PROGRAMS FOR NEW TEACHERS AT ALL EDUCATIONAL LEVELS.

9

9.17 DESIGNING EDUCATIONAL PROGRAMS TO MEET THE EDUCATIONAL NEEDS OF THE NATION'S "HUMAN CAPITAL."

9.18 DEVELOPING QUANTITATIVE INDICATORS TO EVALUATE ATTAINMENT OF NATIONAL GOALS BY THE TOTAL EDUCATIONAL SYSTEM.

9.19 IDENTIFYING THE DATA WHICH DESCRIBE THE ATTRIBUTES OF THE TOTAL EDUCATIONAL SYSTEM.

9.20 BOTH PUBLIC AND PRIVATE INTERESTS: BUSINESS, LABOR UNIONS, EDUCATORS, CIVIC AND COMMUNITY GROUPS, PARTICIPATE IN THE DEVELOPMENT OF EDUCATIONAL INDICATORS AND PROVIDE THE NEEDED DATA.

9.21 COLLECTING AND ANALYZING THE DATA WHICH DESCRIBE THE ATTRIBUTES OF THE TOTAL EDUCATIONAL SYSTEM (PUBLIC AND PRIVATE)

9.22 MAINTAINING DATA ARCHIVES ON THE ATTRIBUTES AND PERFORMANCE OF THE TOTAL EDUCATIONAL SYSTEM.

BASIC, LONG-TERM TRENDS	POSSIBLE FUTURE ROLES
(ECONOMIC SECTOR-NATIONAL) TRANSITIONAL, MASS CONSUMPTION SOCIETY CHARACTERIZED BY HIGHER GNP AND PERSONAL INCOMES, AFFLUENCE (AMONG BETTER EDUCATED).	**7** 7.29 CONTRACTS ADMINISTRATORS - THOSE WHO MANAGE, MONITOR AND EVALUATE EDUCATIONAL SUBCONTRACTS UNDER THE MANAGEMENT OF PRIVATE INDUSTRY. 7.30 INDUSTRIAL EDUCATORS - THOSE WHO PERFORM THE COUNTERPART ROLE OF THE PROFESSIONAL EDUCATOR IN THE ENVIRONMENT OF PRIVATE INDUSTRY OR NOT-FOR-PROFIT ENVIRONMENTS. 7.31 LEISURE-TIME PLANNERS - THOSE WHO PLAN AVOCATIONAL EDUCATION PROGRAMS. — 7.32 LEISURE-TIME TEACHERS - THOSE WHO PROVIDE INSTRUCTION IN AVOCATIONAL EDUCATION PROGRAMS. **8** 8.28 FINANCIAL PLANNERS - THOSE TRAINED IN FINANCE AND EDUCATION WHO ALLOCATE BILLIONS OF DOLLARS FOR EDUCATIONAL RESEARCH, SYSTEMS, PROGRAMS, ETC. 8.29 FINANCIAL COORDINATORS - THOSE EDUCATORS TRAINED IN FINANCE WHO HAVE THE RESPONSIBILITY TO WORK OUT EDUCATIONAL FINANCING WITH FINANCIAL REPRESENTATIVES AT APPROPRIATE PUBLIC LEVELS SUCH AS THE COMMUNITY, CITY, STATE, ETC. 8.30 FINANCIAL MANAGERS - THOSE EDUCATORS PROFESSIONALLY TRAINED IN FINANCE TO SERVE AS STAFF MEMBERS TO EDUCATIONAL ADMINISTRATORS AT ALL EDUCATIONAL LEVELS AND IN ALL TYPES OF COMMUNITIES. **9** 9.23 EDUCATIONAL MODELERS - THOSE EDUCATORS RESPONSIBLE FOR DEVELOPING MATHEMATICAL MODELS OF THE TOTAL EDUCATIONAL SYSTEM. — 9.26 EDUCATIONAL DATA ARCHIVISTS - (1) THOSE ARCHIVISTS WHO DETERMINE WHICH DATA SHOULD BE COLLECTED; (2) THOSE ARCHIVISTS WHO COLLECT THE DATA, (3) THOSE ARCHIVISTS WHO MAINTAIN THE DATA ARCHIVES AND RETRIEVE THE DATA ON REQUEST. 9.24 CULTURAL QUALITY EDUCATORS - THOSE EDUCATORS RESPONSIBLE FOR DETERMINING THE CRITERIA OF "CULTURAL QUALITY" FOR RELEVANCE TO DEVELOPMENT OF PERTINENT EDUCATIONAL PROGRAMS. — 9.27 CULTURAL QUALITY PLANNERS - THOSE WHO DESIGN EDUCATIONAL PROGRAMS FOR MAXIMUM CULTURAL QUALITY. 9.25 HUMAN RESOURCES PLANNERS - THOSE WHO DESIGN EDUCATIONAL PROGRAMS TO MAXIMIZE THE HUMAN CAPITAL OF THE NATION IN LINE WITH NATIONAL GOALS.

MAJOR ISSUES

3
HOULD EDUCATORS SEEK AN ACTIVE LIAISON WITH RIVATE COMPANIES INTERESTED IN ENTERING THE DUCATION MARKET FOR PROFIT? WOULD SUCH A ELATIONSHIP CHALLENGE THE HUMANISTIC VALUES F EDUCATION?

7.37
WHAT EFFECT WILL A NEED FOR "CONTRACTS ADMINISTRA ORS" TO SUPERVISE INDUSTRIAL CONTRACTS HAVE ON THE EDUCATION OF EDUCATIONAL ADMINISTRATORS?

7.36
WHAT EFFECT WILL INDUSTRY-SPONSORED EDUCATION PROGRAMS HAVE ON FORMAL DEGREE AND CERTIFICATION PROGRAMS IN PUBLIC OR PRIVATE EDUCATION?

4
OW CAN FUNDING ARRANGEMENTS IN VOCATIONAL DUCATION BE GEARED TO CHANGES IN OCCUPATIONAL TRUCTURE AS THOSE CHANGES OCCUR?

5
OW CAN EDUCATIONAL PROGRAMS BE ADAPTED TO VOCATIONAL, LEISURE-TIME NEEDS OF THE POP- LATION? (SHOULD THERE BE SUCH AN ADAPTATION N LIGHT OF POTENTIALLY VERY SCARCE RESOURCES?)

1
HOULD EDUCATION DEVELOP ITS OWN IN-HOUSE APABILITIES FOR COMPUTERIZED SYSTEM DEVELOPMENT R CONTINUE TO RELY ON EXTERNAL ORGANIZATIONS?

8.39
HOW CAN THE QUALITY OF EDUCATION BE IMPROVED WHILE THE QUANTITY OF CUST- OMERS IS ALSO INCREASING?

2
IT THE RESPONSIBILITY OF THE EDUCATIONAL YSTEM TO PRODUCE THE TECHNICALLY TRAINED ANPOWER REQUIRED BY A PLANNED ECONOMY?

8.37
HOW CAN JUNIOR AND SENIOR COLLEGES ACCOMODATE THE DOUBLING OF CUS- TOMERS WITHIN TWO DECADES?

8.38
HOW CAN HIGHER EDUCATIONAL INSTITUTIONS ACCOMODATE QUADRUPLED CUSTOMERS WITHIN TWO DECADES - POSTBACCALAUREATE, PH.D.?

3
HALL EDUCATION BECOME MERELY ANOTHER ASPECT OF THE PLANNED ECONOMY OR DOES T HAVE OTHER RESPONSIBILITIES?

8.36
ARE HUMAN BEINGS TO BE CONCEIVED AS MANPOWER RESOURCES OR AS INDIVIDUALS WHOSE SOLE OR PRIMARY OBLIGATION IS SELF-FULFILLMENT?

8.40
WHAT ARE THE ALTERNATIVE SOLUTIONS TO FUTURE POTENTIALLY MASSIVE TEACHER SHORTAGES?

4
HALL EDUCATION ACCEPT THE REQUIREMENTS N EDUCATION FOR A HIGHLY PLANNED AND CONTROLLED SOCIETY OR SHALL IT RESIST HOSE REQUIREMENTS?

5
HAT EFFECT WILL A NEED FOR FINANCIAL EXPERTISE AVE ON THE EDUCATION OF EDUCATIONAL ADMINISTRATORS?

8
HAT ROLE, IF ANY, SHOULD EDUCATORS PLAY N THE EFFORT TO DEFINE NATIONAL GOALS?

9.31
HOW CAN EDUCATORS INJECT A SENSE OF HIGH PURPOSE OR MISSION INTO THE EDUCATIONAL PROCESS IF THE ROLE OF EDUCATION IS ASSUMED TO BE MERELY A PROCESS FOR THE PRODUCTION OF "HUMAN CAPITAL?"

9.33
SHOULD EDUCATORS CONFORM TO GOALS SET BY SOCIAL FORCES OR PRESSURES OUTSIDE OF EDUCATION?

9
HOULD THE EDUCATIONAL SYSTEM BE UBSERVIENT TO THE CONCEPT OF ECONOMIC GROWTH AS A PRIMARY VALUE OF SOCIETY?

0
HAT ROLE, IF ANY, SHOULD EDUCATORS PLAY IN TTEMPTS TO DEVELOP CRITERIA FOR "CULTURAL QUALITY?"

9.32
HOW CAN THE EDUCATIONAL SYSTEM CONTRIBUTE TO THE DEFINITION AND ATTAINMENT OF "CULTURAL QUALITY"?

9.34
WHAT CRITERIA SHOULD BE USED TO EVALUATE THE TOTAL EDUCATIONAL SYSTEM? WHO SHOULD DECIDE, EDUCATORS OR OTHERS?

BASIC, LONG TERM TRENDS	MAJOR SUB-TRENDS
1.0 INDUSTRIALIZATION - WORLDWIDE	1
(ECONOMIC SECTOR-INTERNATIONAL) WORLD-WIDE INDUSTRIALIZATION AND MODERNIZATION	
2.0 INTERNATIONALISM	2
3.0 TRANSPORTATION AND COMMUNICATION	3

1.1 NATIONALISTIC MOVEMENTS AND IDEOLOGY AMONG MANY DEVELOPING, NEWER NATIONS MAY RETARD BUT NOT REVERSE THE TREND TOWARD INDUSTRIALIZATION.

1.2 DEVELOPING ("HAVE-NOT") NATIONS WILL MAKE SLOW BUT STEADY PROGRESS TOWARD INDUSTRIALIZATION ESPECIALLY IF THERE IS A HEAVY EMPHASIS ON UP-GRADING EDUCATIONAL PROGRAMS AND SYSTEMS.

1.3 INCREASING TREND FOR DEVELOPING NATIONS TO RELY HEAVILY UPON MORE INDUSTRIALIZED NATIONS AND THE U.N. FOR TECHNICAL AND EDUCATIONAL ASSISTANCE.

1.4 ACCELERATING TREND TOWA... THE EMERGENCE AND GROW... A WORLDWIDE INDUSTRIAL A... ECONOMIC NETWORK.

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2.1 HIGHLY INDUSTRIALIZED WESTERN NATIONS WILL CONTINUE TO MAKE RAPID ADVANCES ECONOMICALLY AND CONTINUE EXPANDING THEIR WORLDWIDE INDUSTRIAL OPERATIONS.

2.2 PARTICIPATION O.' THE UNITED STATES IN INTERNATIONAL EDUCATION AND CULTURAL EXCHANGE PROGRAMS TENDS TO INCREASE IN VOLUME AND VARIETY.

2.3 FUNDS ARE PROVIDED FOR THE IMPLEMENTATION OF THE INTERNATIONAL EDUCATION ACT OF 1966.

3.1 THE EXPONENTIAL TREND TOWARD IMPROVEMENTS IN TRANSPORTATION AND COMMUNICATION WILL CONTINUE.

3.3 GENERAL TREND IN TECHNICAL DEVELOPMENTS TOWARD INCREASING COMPRESSION OF TIME AND SPACE.

RAPID DEVELOPMENT OF SATELLITE T.V. AND LASER COMMUNICATIONS; SUPERSONIC JET TRANSPORTS IN OPERATION.

3.4 DEVELOPMENT OF INEXPENS... HIGH CAPACITY, WORLDWID... REGIONAL, AND LOCAL, HO... AND BUSINESS COMMUNICA...

THIS LINE LEADS TO ANOTHER ITEM

SOCIAL AND TECHNICAL IMPLICATIONS

THIS LINE LEADS TO ANOTHER ITEM

1

1.5 TREND TOWARD PROGRAMS FOR INTERNATIONAL AND REGIONAL COOPERATION IN ECONOMICS, E.G., THE COMMON MARKET, AND IN EDUCATIONAL PROGRAMS.

1.6 TREND TOWARD MORE CLOSELY INTERMESHED INTERNATIONAL ORGAN ZATIONS, AGENCIES, ETC.

1.7 WORLD-WIDE CULTURAL EXCHANGES AND PERSONAL INTERACTIONS BECOMES INCREASINGLY COMMONPLACE.

1.8 DEVELOPMENT OF A WORLD-WIDE YOUTH MOVEMENT EVOLVING OUT OF THE PEACE CORPS, UNESCO PROGRAMS, ETC., TO ASSIST DEVELOPING, HAVE-NOT NATIONS.

2

2.4 GRADUAL DECLINE OF THE "NATION" AS THE ORGANIZING UNIT TO BE REPLACED BY REGIONAL COMPACTS, COMMON MARKETS, FUNCTIONAL ASSOCIATIONS, PROFESSIONAL GROUPS AND ORGANIZATIONS, INTERNATIONAL INDUSTRIAL ENTERPRISES, ETC.

2.5 THE CONCEPT OF THE NATION-STATE AS ONE'S ONLY OR PRIMARY CENTER OF IDENTIFICATION WILL GRADUALLY DECLINE IN SIGNIFICANCE.

3

3.5 REVOLUTIONARY DEVELOPMENTS IN TRANSPORTATION AND/OR COMMUNICATION MAY REVERSE THE TREND TOWARD URBANIZATION, ACCELERATE THE TREND TO SUBURBAN LIVING, AND MAKE POSSIBLE AND LIKELY STILL WIDER DISTRIBUTIONS OF POPULATIONS.

3.6 THE USE OF MASS MEDIA TO FACILITATE LARGE-GROUP INTERACTIONS AND FEEDBACK ON VITAL PUBLIC ISSUES WILL INCREASE

3.7 SIBURBIA

BASIC, LONG-TERM TRENDS	IMPLICATIONS FOR EDUCATION
(ECONOMIC SECTOR-INTERNATIONAL) WORLD-WIDE INDUSTRIALIZATION AND MODERNIZATION	**1** 1.9 THERE WILL BE AN INCREASING TENDENCY FOR STUDENTS AND EDUCATORS TO INTERSPERSE PERIODS OF STUDY, WORK, TEACHING, AND RESEARCH. 1.10 GROWTH OF INTERNATIONAL EDUCATION IN MANY FORMS: INSTITUTES FOR THE STUDY OF FOREIGN CULTURES; COMPARATIVE SOCIOLOGY: CULTURAL ANTHROPOLOGY; LINGUISTICS; ETC. 1.11 INCREASED USE OF NON-FORMALIZED GROUP ENCOUNTERS FOR VARIOUS EDUCATIONAL PURPOSES, BROADENING OF HORIZONS, POLITICAL INVOLVEMENT, "FREE" SEMINARS, ETC. 1.12 THERE WILL BE INCREASING INTERACTION (STUDENT AND TEACHER EXCHANGE) AND COORDINATION (PROGRAMS AND CURRICULA) AMONG EDUCATIONAL INSTITUTIONS AND SCHOOL SYSTEMS 1.13 THERE WILL BE MASSIVE EFFORTS TO ACHIEVE WORLD-WIDE LITERACY. **2** 2.6 AN INCREASING EDUCATIONAL EMPHASIS ON A UNITARY WORLD VIEW; RELATIVITY OF VALUES; ONE-WORLDISM; INTERNATIONALISM. **3** 3.3 THERE WILL BE AN INCREASING USE OF TRANSPORTATION AND COMMUNICATION MEDIA WHICH WILL MAKE EDUCATION LESS DEPENDENT UPON A PHYSICAL LOCATION. 3.9 EDUCATIONAL PLANTS AND FACILITIES WILL BE MUCH MORE GEOGRAPHICALLY DISTRIBUTED. 3.10 THE POSSIBLE EMERGENCE AND PROLIFERATION OF THE "DISTRIBUTED" UNIVERSITY IN VARIOUS FORMS.

EDUCATIONAL FUNCTIONS

1.15
ADMINISTRATION AND MANAGEMENT OF INDIVIDUAL LEARNING DEVELOPMENT TO ALLOW FOR AND TO ENCOURAGE "DROP-OUT" AND "DROP-IN" FLEXIBILITY.

1.16
MATCHING EDUCATED AND TRAINED PERSONS AS THEY PROCEED THROUGH LEARNING PROGRAMS TO EMPLOYMENT OR UNPAID TASK OPPORTUNITIES. INDIVIDUAL COUNSELING AIDED BY COMPUTERS.

1

1.14
DEVELOPMENT OF WORLD-WIDE, NATIONAL, REGIONAL, COMPREHENSIVE AND LONG-RANGE PLANS FOR LEARNING PROCESSES AND PROCEDURES WITH APPROPRIATE ORGANIZATION. THE PLANNING FUNCTION BECOMES INCREASINGLY COMPLEX AND DIFFICULT.

2

2.7
ORGANIZATION AND CONDUCT OF SEMINARS AND CONFERENCES ON SUBJECTS OF WORLD INTEREST WITH WORLDWIDE PARTICIPATION.

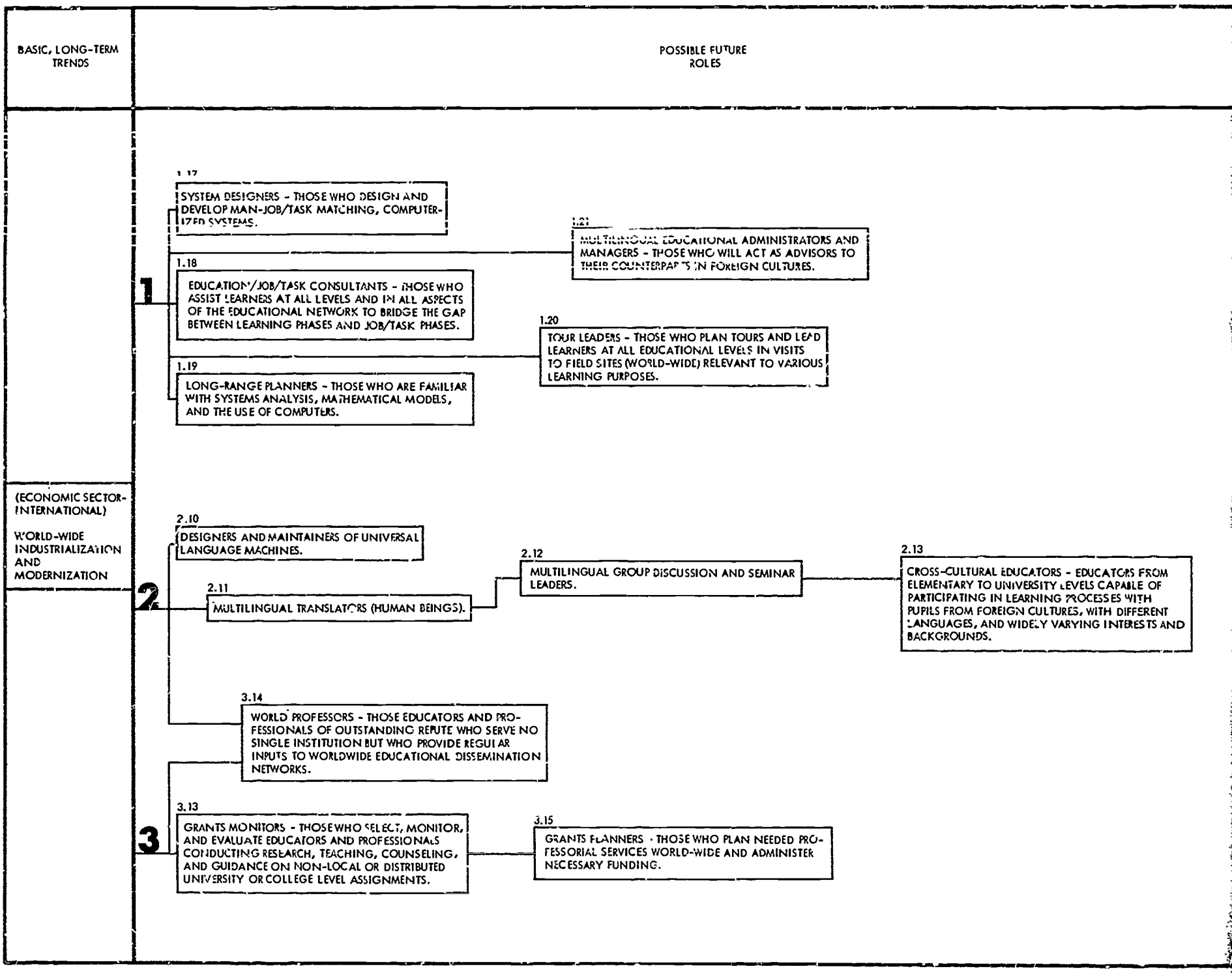
2.9
DEVELOPMENT OF CAPABILITIES FOR SIMULTANEOUS LEARNING BY MULTILINGUAL PARTICIPANTS IN A LEARNING SITUATION OR PROCESS.

2.8
DEVELOPMENT OF A CURRICULA APPROPRIATE FOR A UNITARY WORLD-VIEW: ONE-WORLDISM; INTERNATIONALISM.

3

3.11
DESIGNING AND DEVELOPING THE ADMINISTRATION, OPERATIONS, AND CURRICULA FOR DISTRIBUTED UNIVERSITIES AND DISTRIBUTED LEARNING AT OTHER EDUCATIONAL LEVELS.

3.12
ADMINISTRATION, OPERATIONS, AND CONDUCT OF LEARNING PROCEDURES IN DISTRIBUTED ENVIRONMENTS.


BASIC, LONG-TERM TRENDS
POSSIBLE FUTURE ROLES
1.17
SYSTEM DESIGNERS - THOSE WHO DESIGN AND DEVELOP MAN-JOB/TASK MATCHING, COMPUTER-IZED SYSTEMS.
1.21
MULTILINGUAL EDUCATIONAL ADMINISTRATORS AND MANAGERS - THOSE WHO WILL ACT AS ADVISORS TO THEIR COUNTERPARTS IN FOREIGN CULTURES.
1.18
EDUCATION/JOB/TASK CONSULTANTS - THOSE WHO ASSIST LEARNERS AT ALL LEVELS AND IN ALL ASPECTS OF THE EDUCATIONAL NETWORK TO BRIDGE THE GAP BETWEEN LEARNING PHASES AND JOB/TASK PHASES.
1.20
TOUR LEADERS - THOSE WHO PLAN TOURS AND LEAD LEARNERS AT ALL EDUCATIONAL LEVELS IN VISITS TO FIELD SITES (WORLD-WIDE) RELEVANT TO VARIOUS LEARNING PURPOSES.
1
1.19
LONG-RANGE PLANNERS - THOSE WHO ARE FAMILIAR WITH SYSTEMS ANALYSIS, MATHEMATICAL MODELS, AND THE USE OF COMPUTERS.
(ECONOMIC SECTOR-INTERNATIONAL)
WORLD-WIDE INDUSTRIALIZATION AND MODERNIZATION
2.10
DESIGNERS AND MAINTAINERS OF UNIVERSAL LANGUAGE MACHINES.
2.12
MULTILINGUAL GROUP DISCUSSION AND SEMINAR LEADERS.
2.13
CROSS-CULTURAL EDUCATORS - EDUCATORS FROM ELEMENTARY TO UNIVERSITY LEVELS CAPABLE OF PARTICIPATING IN LEARNING PROCESSES WITH PUPILS FROM FOREIGN CULTURES, WITH DIFFERENT LANGUAGES, AND WIDELY VARYING INTERESTS AND BACKGROUNDS.
2
2.11
MULTILINGUAL TRANSLATORS (HUMAN BEINGS).
3.14
WORLD PROFESSORS - THOSE EDUCATORS AND PROFESSIONALS OF OUTSTANDING REPUTE WHO SERVE NO SINGLE INSTITUTION BUT WHO PROVIDE REGULAR INPUTS TO WORLDWIDE EDUCATIONAL DISSEMINATION NETWORKS.
3.13
GRANTS MONITORS - THOSE WHO SELECT, MONITOR, AND EVALUATE EDUCATORS AND PROFESSIONALS CONDUCTING RESEARCH, TEACHING, COUNSELING, AND GUIDANCE ON NON-LOCAL OR DISTRIBUTED UNIVERSITY OR COLLEGE LEVEL ASSIGNMENTS.
3.15
GRANTS PLANNERS - THOSE WHO PLAN NEEDED PROFESSORIAL SERVICES WORLD-WIDE AND ADMINISTER NECESSARY FUNDING.
3

MAJOR ISSUES

1.22
HOW CAN THE TRADITIONAL LOCAL ADMINISTRATION OF EDUCATION BE ADAPTED TO THE FUTURE POTENTIAL MOBILITY OF LEARNERS?

1.25
HOW CAN EVALUATION CRITERIA FOR STUDENT PROGRESS IN NON-FORMAL LEARNING SITUATIONS AND PROGRAMS BE DEVELOPED?

1.27
HOW CAN EDUCATORS DESIGN AND DEVELOP AUTOMATED PROCESSING AND MAINTENANCE OF STUDENT RECORDS FOR BOTH FORMAL AND INFORMAL LEARNING EXPERIENCES?

1

1.23
HOW CAN EDUCATORS PLAN FOR THE SIMULTANEOUS USE OF LIMITED FACULTY RESOURCES FOR BOTH INTERNATIONAL EDUCATION AND DOMESTIC EDUCATIONAL PROGRAMS AND NEEDS?

1.26
ARE THERE ADEQUATE CAPABILITIES AT LOCAL AND STATE LEVELS FOR LONG-RANGE EDUCATIONAL PLANNING?

1.24
WHAT PLANNING IS NEEDED FOR LARGE-SCALE EXPANSION OF FACILITIES AND FACULTIES FOR INTERNATIONALLY ORIENTED EDUCATION?

2.14
HOW WILL NEW REQUIREMENTS FOR LONG-RANGE PLANNING AFFECT TYPES OF PERSONNEL EMPLOYED IN EDUCATION? CAREER LADDERS? SALARY SCHEDULES? TRAINING PROGRAMS? CREDENTIAL REQUIREMENTS?

2

2.15
WHAT MUST EDUCATORS DO TO PREPARE FOR MULTINATIONAL PLANNING, COORDINATION, ADMINISTRATION, AND OPERATION OF WORLD-WIDE EDUCATIONAL FACILITIES AND PERSONNEL?

2.16
HOW CAN EXISTING CURRICULA BE RECONCILED WITH NEW CURRICULA FOR A WORLD CHARACTERIZED BY INTERNATIONALISM, WORLD-WIDE INTERACTION, AND MOBILITY?

3.16
HOW CAN EXISTING LOCAL EDUCATIONAL ORGANIZATION BE MADE COMPATIBLE WITH FUTURE NON-LOCALIZED CAPABILITIES OF ELECTRONIC TECHNOLOGY?

3

BASIC, LONG-TERM TRENDS	MAJOR SUB-TRENDS
13.0 TECHNOLOGICAL REPLACEMENT	**13** 13.1 THE TIME LAG BETWEEN THE DISCOVERY OF SCIENTIFIC PRINCIPLES AND THEIR PRACTICAL APPLICATIONS IS CONSTANTLY DECREASING. → 13.2 THERE ARE INCREASING PRESSURES TO FORECAST SCIENTIFIC DISCOVERIES AND TO ANTICIPATE THEIR POSSIBLE APPLICATIONS. → 13.3 INSTITUTIONALIZATION OF THE FORECASTING FUNCTION.
14.0 TEMPO OF CHANGE	**14** 14.1 INCREASING TEMPO OF TECHNOLOGICAL, SCIENTIFIC, AND SOCIAL CHANGE. → 14.2 DUE TO THE TEMPO OF CHANGE, RANDOM, REACTIVE ADAPTATION IS NOT ADEQUATE. → 14.4 LONG-RANGE PLANNING BECOMES INCREASINGLY CRITICAL FOR ALL TYPES OF ENTERPRISES.
(SCIENCE & TECHNOLOGY SECTOR) (I ORGANIZATION) INSTITUTIONALIZATION OF CHANGE, ESPECIALLY THROUGH RESEARCH, DEVELOPMENT, INNOVATION & ORGANIZED DIFFUSION.	14.3 INFORMATION OVERLOAD BECOMES AN INCREASINGLY CRITICAL PROBLEM FOR PROFESSIONALS, SCIENTISTS, MANAGERS. → 14.5 PROFESSIONALS, SCIENTISTS, AND MANAGERS WILL HAVE DECREASING AMOUNTS OF LEISURE TIME.
15.0 TECHNOLOGICAL COMPLEXITY	**15** 15.1 THE TECHNOLOGICAL BASIS OF AMERICAN LIFE IS CHARACTERIZED BY INCREASING COMPLEXITY AND SOPHISTICATION. → 15.2 THE LONG-TERM EFFECT OF AUTOMATION, CYBERNATION, ETC., IS TO TRANSFORM THE NEED FOR HUMAN CAPABILITIES INCREASINGLY IN THE DIRECTION OF SYMBOL MANIPULATION. → 15.5 A SHIFT IN POWER WITHIN INDUSTRIAL ENTERPRISE FROM CAPITAL TO "ORGANIZED INTELLIGENCE." → 15.8 INCREASING CONCERN WITH THE NATURE OF "ORGANIZATION MAN" AND ORGANIZATION THEORY."
	15.3 TECHNOLOGICAL ADVANCE ENSHRINED AS SOCIALLY DESIRABLE AND GOOD. → 15.7 LARGE-SCALE AND COMPLEX ORGANIZATION NEEDED TO INTEGRATE WORK OF SPECIALISTS.
	15.4 ADVANCED TECHNOLOGY REQUIRES HIGHLY SPECIALIZED MANPOWER. → 15.6 SPECIALIZED KNOWLEDGE AND ITS COORDINATION BECOME INCREASINGLY DECISIVE IN ECONOMIC SUCCESS.

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

SOCIAL AND TECHNICAL IMPLICATIONS

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

13

13.4 PUBLIC AND PRIVATE ORGANIZATIONS EMPHASIZE RESEARCH ON NEW TECHNICAL APPLICATIONS.

13.5 INCREASE IN FUNDING FOR RESEARCH ON THE TECHNICAL APPLICATIONS OF SCIENCE.

13.7 THE EMERGENCE AND PROLIFERATION OF NEW TECHNOLOGIES AT A RAPID RATE.

13.6 INCREASING RECOGNITION THAT THE UNANTICIPATED SOCIAL CONSEQUENCES OF NEW TECHNOLOGIES MAY BE A THREAT TO THE SURVIVAL OF THE HUMAN SPECIES.

13.8 INCREASE IN FUNDING FOR RESEARCH INTO THE SOCIAL CONSEQUENCES OF SCIENCE.

14

14.8 DESIGNING AND DEVELOPING PROCEDURES, ORGANIZATIONS, AND METHODS FOR CHANGE. ("INSTITUTIONALIZATION OF INNOVATION.")

14.7 NEW SCIENCES AND TECHNICAL SPECIALTIES EMERGE AND REPLACE ONE ANOTHER WITH EXTRAORDINARY SPEED.

14.9 A HISTORY OF MULTIPLE, SEQUENTIAL CAREERS BECOMES ACCEPTABLE AND NORMAL.

14.6 AN ECONOMY CHARACTERIZED BY CHANGE REQUIRES A LABOR FORCE WITH TRANSFERABLE WORK SKILLS.

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15.15 THE FUNCTION OF MANAGEMENT IN LARGE ORGANIZATIONS IS TO RATIFY DECISIONS MADE BY TECHNICALLY COMPETENT SPECIALISTS.

15.18 POWER AND CONTROL PASSES FROM THE ENTREPRENEUR TO THE TECHNICAL EXPERT IN THE MODERN CORPORATION.

15.10 EMERGENCE OF A NEW POWER CLASS BASED ON EDUCATION: A "MERITOCRACY," THE "ACTION INTELLECTUALS," GALBRAITH'S "TECHNOSTRUCTURE."

15.13 PROBLEMS ATTACKED AND DECISIONS MADE NOT BY INDIVIDUALS BUT BY COMMITTEES, TASK FORCES, GROUPS, CONFERENCES, ETC.

15.9 IDENTIFICATION WITH ONE'S ORGANIZATION'S GOALS BECOMES INCREASINGLY A MOTIVATING FACTOR IN INDIVIDUAL BEHAVIOR.

15.12 THE GRADUAL DECLINE OF PERSONAL MONETARY PROFIT AS A MOTIVATING FORCE.

15.17 INCREASING ACCEPTANCE AND APPLICATION OF CONCEPT OF PAYING STUDENTS TO LEARN.

15.11 FUTURE MANPOWER NEEDS IN SPECIALIZED FIELDS MUST BE PLANNED FOR IN ADVANCE.

15.14 THERE WILL BE A RAPID GROWTH IN THE NEED FOR SUB-PROFESSIONAL BUT HIGHLY SKILLED TECHNICIANS.

15.16 INCREASINGLY CRITICAL GAP BETWEEN DEMAND AND SUPPLY FOR TECHNICAL MANPOWER BY 1980's.

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

BASIC, LONG-TERM TRENDS

IMPLICATIONS FOR EDUCATION

(SCIENCE & TECHNOLOGY SECTOR)

(I ORGANIZATION)

INSTITUTIONALIZATION OF CHANGE, ESPECIALLY THROUGH RESEARCH, DEVELOPMENT, INNOVATION & ORGANIZED DIFFUSION.

THIS LINE LEADS TO ANOTHER ITEM

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13.9 EDUCATION HAS CONSTANTLY DECREASING TIME TO ADJUST TO THE IMPACT OF SCIENCE AND TECHNOLOGICAL APPLICATIONS.

13.10 EDUCATIONAL PROGRAMS AND CURRICULA ARE OBSOLETE AT A MORE RAPID RATE.

13.11 TECHNICAL TEXTBOOKS ARE OBSOLETE BY THE TIME THEY ARE PUBLISHED.

13.13 EDUCATORS WILL BE REQUIRED TO UPDATE THEIR KNOWLEDGE AND SKILLS AT FREQUENT INTERVALS.

13.12 EDUCATORS SUFFER FROM THE RAPID OBSOLESCENCE OF THEIR UNDERSTANDING OF NEW TECHNOLOGIES.

13.14 EDUCATORS WILL SUFFER FROM INSECURITY AND ANXIETY DUE TO THEIR INABILITY TO KEEP ABREAST OF CHANGES IN THEIR FIELDS.

14

14.10 THERE WILL BE AN INCREASING REQUIREMENT FOR LIFE-LONG LEARNING AND RE-EDUCATION GEARED TO INDIVIDUAL NEEDS.

14.11 THE CAPABILITY TO MASTER NEW INFORMATION WILL BE ESSENTIAL FOR PROFESSIONALS, SCIENTISTS, TECHNICIANS, AND MANAGERS.

14.12 IT WILL BE NECESSARY TO SPEEDUP AND INTENSIFY THE LEARNING PROCESS AT ALL LEVELS OF EDUCATION.

14.13 THERE WILL BE AN INCREASING EMPHASIS IN LEARNING HOW TO LEARN RATHER THAN ROTE LEARNING OF SUBJECT MATTER.

14.14 TREND TOWARD GREATER INVOLVEMENT OF PRIVATE BUSINESS IN CLASSROOM PROCEDURES (CAI, TEACHING DEVICES, TEACHING AIDS, ETC.)

14.15 TECHNOLOGY AND PLANNING BECOME INCREASINGLY DOMINANT FACTORS IN EDUCATION AS IN INDUSTRY.

14.16 THE BUSINESS COMMUNITY AND VOCATIONAL EDUCA MUST ENGAGE IN AN INTERACTIVE PROCESS TO ASSU COMPATIBILITY BETWEEN VOC. ED. PROGRAMS AND T CHANGING JOB MARKET.

14.17 EDUCATION, AS IN THE CASE OF INDUSTRY AND THE MILITARY, WILL NEED ITS OWN TECHNICAL SPECIALISTS, ENGINEERS, ETC.

14.18 THERE WILL BE AN INCREASE IN THE USE OF MIND-EXPANDING DRUGS TO ACCELERATE THE LEARNING PROCESS.

15

15.20 A GREATER DEMAND FOR EDUCATION RELATED TO SYMBOL MANIPULATION.

15.19 ROLE OF THE UNIVERSITY INCREASINGLY RELEGATED TO THAT OF A SUPPLIER OF PROFESSIONALLY AND TECHNICALLY TRAINED MANPOWER.

15.21 MASSIVE EFFORTS TO UPGRADE U. S. EDUCATION.

15.22 STUDENT ENROLLMENTS WILL INCREASE AT A FASTER RATE THAN TEACHER RECRUITMENT.

15.23 POSSIBLE DETERIORATION IN THE QUALITY OF TECHNICAL TRAINING.

THIS LINE LEADS TO ANOTHER ITEM

EDUCATIONAL FUNCTIONS

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13.15 MONITORING CHANGES IN SCIENCE AND TECHNOLOGICAL APPL'CATIONS FOR IMPLICATIONS FOR ED PROGRAMS

13.18 UPDATING AND MAINTAINING EDUCATIONAL SUBJECT MATTER TO PREVENT OBSOLESCENCE.

13.16 PLANNING THE ACCELERATION OF CHANGE IN EDUCATIONAL PROGRAMS AND CURRICULA.

13.19 INTEGRATION OF PRACTICING SCIENTISTS AND TECHNOLOGISTS INTO EDUCATION TASKS.

13.22 WAIVING OF CERTIFICATION REQUIREMENTS TO TEACH FOR SCIENTISTS AND TECHNICIANS.

13.17 RESEARCH INTO METHODS AND PROCEDURES FOR PREVENTING PREMATURE OBSOLESCENCE OF CURRICULA, TEXTBOOKS, ETC.

13.20 MANDATORY IN-SERVICE TRAINING OF EDUCATORS TO OBTAIN CURRENT KNOWLEDGE.

13.21 FREQUENT SABBATIC LEAVES FOR RE-EDUCATION PURPOSES.

14

14.19 RESEARCH INTO RATES OF KNOWLEDGE OBSOLESCENCE IN SCIENTIFIC AND TECHNICAL AREAS.

14.20 OPERATION OF COMPUTERIZED MAN-JOB MATCHING SYSTEMS TO FACILITATE JOB TRANSFERABILITY.

14.24 COUNSELING AND GUIDANCE FOR INDIVIDUALS ON CAREER AND JOB SEQUENCING.

14.25 COUNSELING AND GUIDANCE RE. SEQUENTIAL PHASING OF WORK AND RE-EDUCATION.

14.21 DETERMINATION OF THE CRITERIA FOR "IMPERATIVE" SUBJECTS AS DISTINCT FROM ELECTIVE SUBJECTS.

14.22 RESEARCH INTO METHODS OF ACCELERATING THE LEARNING PROCESS.

14.23 CONTROLLING THE USE OF MIND EXPANDING DRUGS IN LEARNING PROCESSES AND SITUATIONS.

15

15.24 DEVELOPING EDUCATIONAL PROGRAMS THAT FOCUS ON THE SYMBOL MANIPULATING FUNCTIONS (MATH, ENGLISH, ETC.).

15.25 IDENTIFICATION OF STUDENTS WITH CAPABILITIES FOR HIGHER LEVELS OF EDUCATION AND TRAINING.

BASIC, LONG-TERM TRENDS	POSSIBLE FUTURE ROLES
(SCIENCE & TECHNOLOGY SECTOR) (I ORGANIZATION) INSTITUTIONALIZATION OF CHANGE, ESPECIALLY THROUGH RESEARCH, DEVELOPMENT, INNOVATION & ORGANIZED DIFFUSION.	**13** 13.23 FUTURISTS - THOSE WHO SYSTEMATICALLY STUDY THE FUTURE ON A FULL-TIME BASIS. 13.24 TRANSLATORS OR INTERLOCUTORS - THOSE WHO BRIDGE THE GAP BETWEEN SCIENTISTS AND NON-SCIENTISTS WITH A NEED TO KNOW SUCH AS LEGISLATORS, MANAGERS, TEACHERS, ADMINISTRATORS, AND THE PUBLIC. 13.25 CURRICULA PLANNERS AND MAINTAINERS - THOSE WHO PLAN FOR CHANGES IN CURRICULA AND THE DEVELOPMENT OF NEW CURRICULA IN ACCORDANCE WITH DEVELOPMENTS IN SCIENCE AND THE SHIFTING CONTENT OF OCCUPATIONS 13.26 CURRICULA SCHEDULERS - THOSE WHO DELETE OBSOLETE CURRICULA AND INTRODUCE NEW CURRICULA INTO THE EDUCATIONAL SYSTEM. 13.27 THE CHANGE AGENT - THOSE RESPONSIBLE IN EDUCATIONAL INSTITUTIONS FOR THE INTRODUCTION OF INNOVATIONS. 13.28 COUNSELORS FOR EDUCATORS - THOSE WHO PROVIDE GUIDANCE RE EDUCATORS' NEEDS FOR IN-SERVICE TRAINING AND RE-EDUCATION. 13.29 DEMONSTRATION EDUCATORS - THOSE TEACHERS WHO DEMONSTRATE THE USE OF NEW TEACHING METHODS AND NEW SUBJECT MATTER TO OTHER EDUCATORS. 13.30 SCIENCE AND TECHNOLOGY EDUCATORS - THOSE WHO PROVIDE TRAINING IN CURRENT KNOWLEDGE FOR IN-SERVICE TEACHERS. **14** 14.26 SCIENCE AND TECHNOLOGY ADVISORS - THOSE SCIENTISTS AND TECHNOLOGISTS WHO PROVIDE GUIDANCE FOR IN-SERVICE TEACHERS ON THE NEED FOR NEW KNOWLEDGE ACQUISITION. 14.27 VOCATIONAL EDUCATION PLANNERS - THOSE RESPONSIBLE TO PLAN FOR AND TO MODIFY VOCATIONAL EDUCATION CURRICULA IN ACCORDANCE WITH CHANGING JOB PATTERNS AND EMERGENCE OF NEW TYPES OF CAREERS. 14.28 EDUCATIONAL PSYCHOPHARMACOLOGIST - THOSE WHO ADMINISTER DRUGS TO FACILITATE THE LEARNING PROCESS. 14.29 COUNSELORS FOR NON-EDUCATORS - THOSE WHO PROVIDE GUIDANCE TO WORKING ADULTS RE: NEEDS FOR RE-TRAINING AND RE-EDUCATION. 14.30 SYSTEM OPERATORS - THOSE WHO OPERATE COMPUTERIZED MAN-JOB MATCHING SYSTEMS. **15** 15.26 TALENT IDENTIFYERS - THOSE WHO IDENTIFY AND COUNSEL HIGHLY GIFTED LEARNERS FOR EDUCATIONAL PROGRAMS AT ELITE LEVEL. 15.27 SYMBOL USE DESIGNERS - THOSE WHO DESIGN INDIVIDUALIZED TYPES OF INSTRUCTION IN AREA OF SYMBOL MANIPULATION 15.28 SYMBOL USE EDUCATORS - THOSE WHO PROVIDE EXPERT INSTRUCTION IN SYMBOL MANIPULATION.

THOSE
WLEDGE

13

13.31 SHOULD THE SCHOOL CONTINUE TO BE CONCEIVED AS A BRIDGE FOR THE USES OF THE PAST IN THE PRESENT OR AS A BRIDGE ABOUT THE FUTURE FOR PRACTICES IN THE PRESENT? OR, IF BOTH, HOW SHALL THEY BE COMBINED?

13.32 IN LIGHT OF THE RAPID OBSOLESCENCE OF SUBJECT CONTENT, HOW SHALL EDUCATIONAL SYSTEMS BE DESIGNED TO REMAIN CURRENT WITH STATE OF THE ART?

13.33 IS THE CONCEPT OF THE SCHOOL AS AN AUTONOMOUS UNIT IN SOCIETY OUTMODED? IF SO, WHAT SHOULD REPLACE IT?

13.34 HOW CAN FUTURISTS, PROFESSIONAL EDUCATORS, AND THE PUBLIC BE BROUGHT TOGETHER IN A MEANINGFUL DIALOGUE ABOUT THE FUTURE REQUIREMENTS FOR EDUCATION?

13.35 IS THE CONCEPT OF THE EDUCATOR AS A SPECIALIST OBSOLETE? IF SO, HOW WILL THE FUNCTION OF TRANSMITTING KNOWLEDGE BE CARRIED OUT?

13.36 HOW CAN EDUCATORS, NO LESS THAN OTHER PROFESSIONALS, COPE WITH INFORMATION EXCESS?

13.37 WILL THE PROFESSIONALIZATION OF THE ROLE OF THE GUIDANCE COUNSELOR BE NECESSARY IF THE TEACHER'S ROLE ENCOMPASSES THE GUIDANCE FUNCTION?

14

14.31 HOW CAN THE EDUCATION OF EDUCATORS BE ACCOMODATED TO THE NEED FOR LIFELONG LEARNING AND RE-EDUCATION?

14.32 WHAT IS THE METHODOLOGY FOR TEACHING LEARNERS HOW TO THINK? WHERE HOW, AND BY WHOM WILL EDUCATORS BE TAUGHT THIS?

14.33 WHO DECIDES AND BY WHOSE CRITERIA WHAT THE COMMON CORE OF EDUCATION WILL BE FOR ALL CITIZENS REGARDLESS OF ABILITY?

14.34 HOW CAN VOCATIONAL EDUCATION BE MADE MORE ADAPTABLE TO A RAPIDLY CHANGING AND UNCERTAIN JOB MARKET? IS THE CONCEPT OF TEACHING SPECIFIC JOBS OBSOLETE?

14.35 WHAT CHANGES IN EDUCATIONAL ADMINISTRATION WILL BE REQUIRED BY INTERSPERSED PHASES OF WORK AND EDUCATION SPREAD OVER A LIFETIME?

14.36 WHAT ARE THE UNANTICIPATED CONSEQUENCES OF ALLOWING EACH LEARNER TO PROGRESS AT HIS OWN RATE THROUGH EDUCATIONAL PROGRAMS?

14.37 WHAT RELATIONSHIP WILL PREVAIL BETWEEN INDUSTRY AND THE PUBLIC SCHOOLS RE: THE RE-TRAINING OF WORKERS WHOSE SKILLS BECOME OBSOLETE?

15

15.29 HOW CAN THE NEED FOR GENERALISTS BE RECONCILED WITH THE PRESSURES OF LARGE-SCALE ORGANIZATIONS FOR INCREASINGLY NARROW SPECIALISTS?

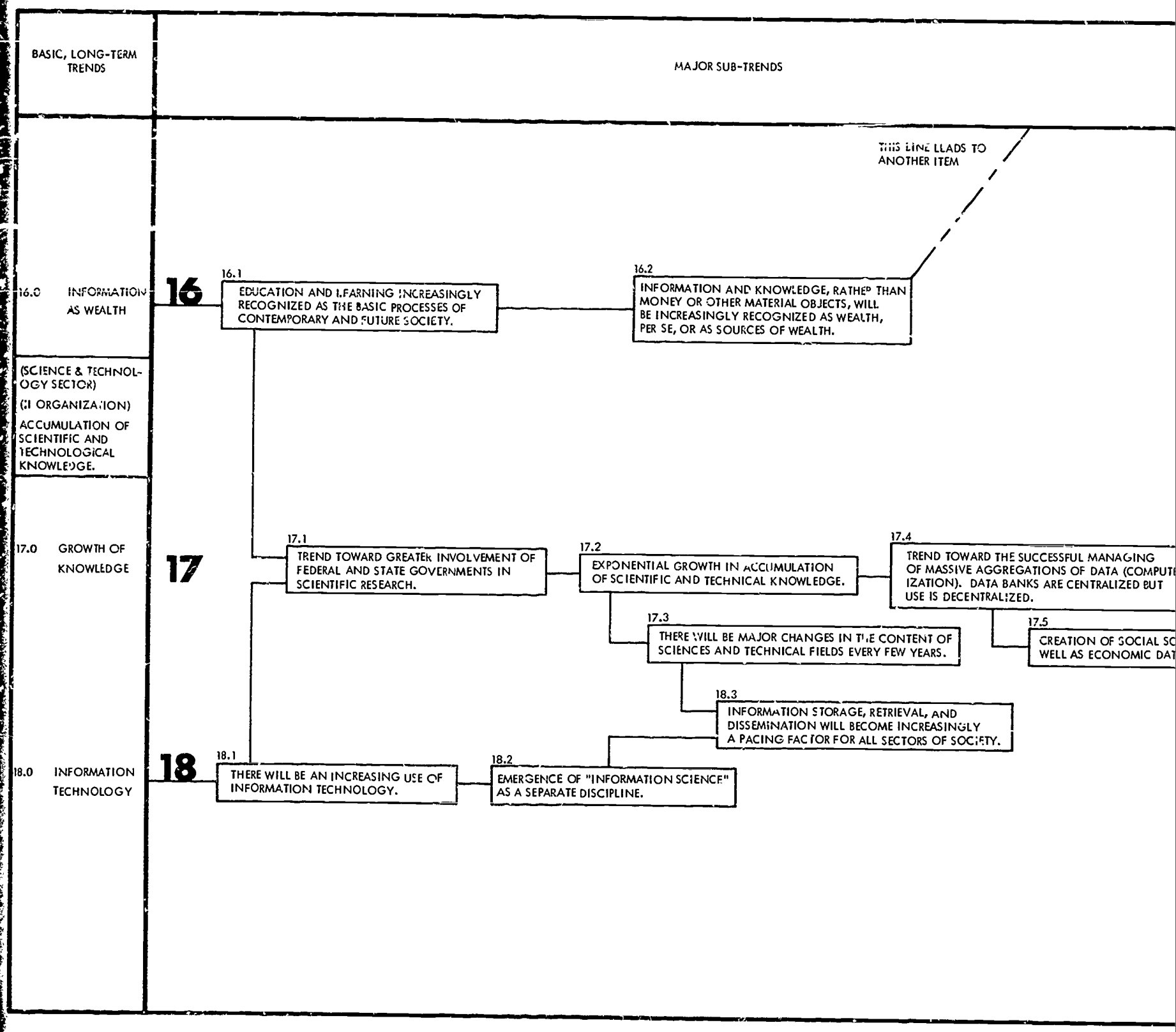
15.30 HOW CAN EDUCATORS UPGRADE AND IMPROVE ON A MAJOR SCALE THE TRAINING IN SYMBOL MANIPULATION?

15.31 DOES THE TECHNOSTRUCTURE SET SOCIAL GOALS OR DOES IT SERVE SOCIAL COALS?

15.32 WHAT IS THE EFFECT OF THE PREVALENCE OF GROUP DECISION MAKING IN LARGE ORGANIZATIONS ON THE EDUCATIONAL PROCESS? SHOULD EDUCATORS RESIST THIS TENDENCY OR ADAPT EDUCATIONAL PROGRAMS TO IT?

15.33 SHOULD EDUCATORS ADHERE TO THEIR TRADITIONS OF EQUALITY IN EDUCATION OR ADAPT THEMSELVES TO THE NEEDS OF A TECHNOLOGICAL SOCIETY FOR AN INTELLECTUAL ELITE?

THIS LINE LEADS TO ANOTHER ITEM


BASIC, LONG-TERM TRENDS
MAJOR SUB-TRENDS
THIS LINE LEADS TO ANOTHER ITEM
16.0 INFORMATION AS WEALTH
16
16.1
EDUCATION AND LEARNING INCREASINGLY RECOGNIZED AS THE BASIC PROCESSES OF CONTEMPORARY AND FUTURE SOCIETY.
16.2
INFORMATION AND KNOWLEDGE, RATHER THAN MONEY OR OTHER MATERIAL OBJECTS, WILL BE INCREASINGLY RECOGNIZED AS WEALTH, PER SE, OR AS SOURCES OF WEALTH.
(SCIENCE & TECHNOLOGY SECTOR)
(I ORGANIZATION)
ACCUMULATION OF SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE.
17.0 GROWTH OF KNOWLEDGE
17
17.1
TREND TOWARD GREATER INVOLVEMENT OF FEDERAL AND STATE GOVERNMENTS IN SCIENTIFIC RESEARCH.
17.2
EXPONENTIAL GROWTH IN ACCUMULATION OF SCIENTIFIC AND TECHNICAL KNOWLEDGE.
17.4
TREND TOWARD THE SUCCESSFUL MANAGING OF MASSIVE AGGREGATIONS OF DATA (COMPUTE IZATION). DATA BANKS ARE CENTRALIZED BUT USE IS DECENTRALIZED.
17.3
THERE WILL BE MAJOR CHANGES IN THE CONTENT OF SCIENCES AND TECHNICAL FIELDS EVERY FEW YEARS.
17.5
CREATION OF SOCIAL SC WELL AS ECONOMIC DAT
18.3
INFORMATION STORAGE, RETRIEVAL, AND DISSEMINATION WILL BECOME INCREASINGLY A PACING FACTOR FOR ALL SECTORS OF SOCIETY.
18.0 INFORMATION TECHNOLOGY
18
18.1
THERE WILL BE AN INCREASING USE OF INFORMATION TECHNOLOGY.
18.2
EMERGENCE OF "INFORMATION SCIENCE" AS A SEPARATE DISCIPLINE.

SOCIAL AND TECHNICAL IMPLICATIONS

THIS LINE LEADS TO ANOTHER ITEM

THIS LINE LEADS TO ANOTHER ITEM

16

16.3 RISING STATUS OF THE INFORMATION AND KNOWLEDGE-GENERATING PROFESSIONS VS TRADITIONAL MANAGEMENT.

16.5 CONTINUED GROWTH OF KNOWLEDGE PRODUCING ORGANIZATIONS: NOT-FOR-PROFITS; RESEARCH INSTITUTES; "THINK-TANKS"; AND INFLUX OF UNIVERSITY GRADUATES INTO INDUSTRY.

16.6 THE SOURCES OF NEW KNOWLEDGE WILL BE MORE WIDELY DISTRIBUTED AMONG INDUSTRIES, UNIVERSITIES, NOT-FOR-PROFITS, INSTITUTES, GOV'T LABORATORIES, ETC.

16.4 THERE WILL BE AN INCREASING NEED FOR NEW ORGANIZATIONAL AND TECHNICAL ARRANGEMENTS TO FACILITATE THE DISSEMINATION OF NEW SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENTS.

17

17.6 IMPROVEMENTS IN COMPUTER-BASED TIME-SHARING TECHNOLOGY

17.9 MULTI-ORGANIZATIONAL AND MULTI-INSTITUTIONAL LINKAGES MADE POSSIBLE SHARING COMMON DATA SOURCES.

17.11 A UNIVERSAL, MACHINE LANGUAGE.

17.7 DEVELOPMENT OF CAPABILITIES FOR INDIVIDUALS TO INTERROGATE SOCIAL SCIENCE AND OTHER ARCHIVES.

17.10 SMALLER, LOCAL COLLEGES, JR. COLLEGES, HIGH SCHOOLS, ETC., WILL HAVE ACCESS VIA TIME-SHARING SYSTEMS TO REGIONAL AND NATIONAL DATA ARCHIVES.

17.8 TIME-SHARED COMPUTER UTILITIES SERVING THOUSANDS OF USERS AT LOW COST.

18

18.14 FEASIBILITY DEMONSTRATED OF DIRECT ELECTRO-MECHANICAL INTERACTION BETWEEN THE HUMAN BRAIN AND A COMPUTER.

18.5 COMPUTERS MINITURIZED TO ONE CUBIC FOOT OR LESS BY THE 1980's.

18.8 175,000 COMPUTERS IN USE BY 1988.

18.11 DIRECT VERBAL COMMUNICATION WITH INFORMATION SYSTEMS OF VARIOUS TYPES.

18.4 MONTHLY CHARGE OF 10 CENTS TO LEASE A COMPUTER WITH ENOUGH CAPACITY TO STORE ONE MILLION CHARACTERS BY THE 1980's.

18.9 PERSONAL DIAL-A-PHONE ACCESS TO EXTENSIVE UNIVERSITY, NATIONAL, AND INTERNATIONAL DATA BANKS.

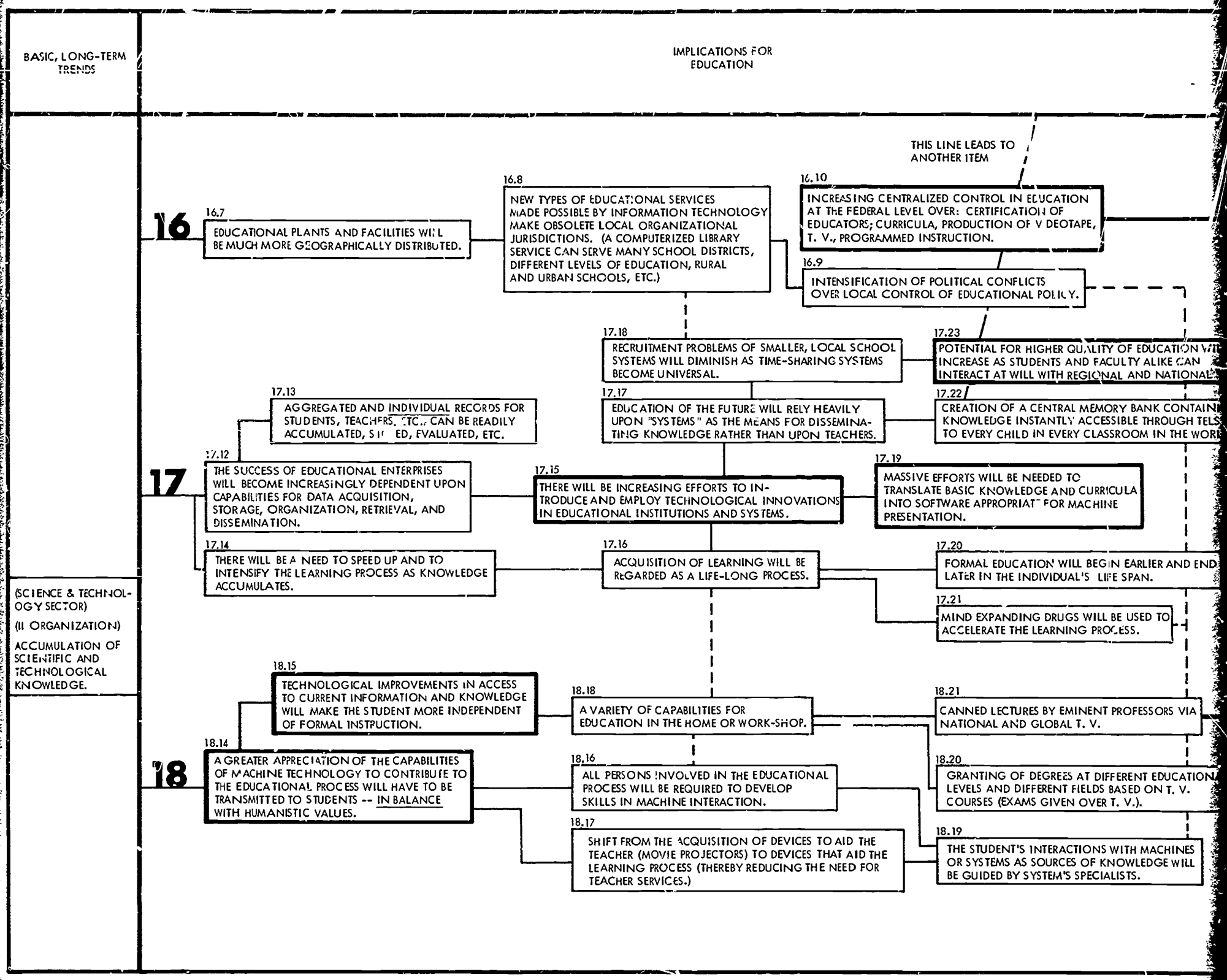
18.12 WIDESPREAD USE OF FACSIMILE PRINTERS TO PRODUCE NEWS AND INFORMATION IN THE HOME.

18.6 GENERAL USE OF WIDE BAND COMMUNICATIONS SYSTEMS WHICH CARRY VIDEO AND INFORMATION CHANNELS INTO AVERAGE HOMES.

18.10 SATELLITE COMMUNICATION NETWORKS TRANSMITTING TEXT, VISUAL IMAGES, SPEECH AT LOW COST TO HOMES, FACTORIES, OFFICES, SCHOOLS, DATA BANKS.

18.13 AUTOMATED VOTING IN THE HOME ON PUBLIC ISSUES IMMEDIATELY FOLLOWING DEBATE OVER T. V.

18.7 COLOR VIDEO TAPE RECORDERS PRICED FOR A MASS MARKET BY THE 1980s.


BASIC, LONG-TERM TRENDS
IMPLICATIONS FOR EDUCATION
THIS LINE LEADS TO ANOTHER ITEM
16
16.7
EDUCATIONAL PLANTS AND FACILITIES WILL BE MUCH MORE GEOGRAPHICALLY DISTRIBUTED.
16.8
NEW TYPES OF EDUCATIONAL SERVICES MADE POSSIBLE BY INFORMATION TECHNOLOGY MAKE OBSOLETE LOCAL ORGANIZATIONAL JURISDICTIONS. (A COMPUTERIZED LIBRARY SERVICE CAN SERVE MANY SCHOOL DISTRICTS, DIFFERENT LEVELS OF EDUCATION, RURAL AND URBAN SCHOOLS, ETC.)
16.10
INCREASING CENTRALIZED CONTROL IN EDUCATION AT THE FEDERAL LEVEL OVER: CERTIFICATION OF EDUCATORS; CURRICULA, PRODUCTION OF V DEOTAPE, T. V., PROGRAMMED INSTRUCTION.
16.9
INTENSIFICATION OF POLITICAL CONFLICTS OVER LOCAL CONTROL OF EDUCATIONAL POLICY.
17.18
RECRUITMENT PROBLEMS OF SMALLER, LOCAL SCHOOL SYSTEMS WILL DIMINISH AS TIME-SHARING SYSTEMS BECOME UNIVERSAL.
17.23
POTENTIAL FOR HIGHER QUALITY OF EDUCATION WI INCREASE AS STUDENTS AND FACULTY ALIKE CAN INTERACT AT WILL WITH REGIONAL AND NATIONAL
17.13
AGGREGATED AND INDIVIDUAL RECORDS FOR STUDENTS, TEACHERS, ETC., CAN BE READILY ACCUMULATED, S ED, EVALUATED, ETC.
17.17
EDUCATION OF THE FUTURE WILL RELY HEAVILY UPON "SYSTEMS" AS THE MEANS FOR DISSEMINATING KNOWLEDGE RATHER THAN UPON TEACHERS.
17.22
CREATION OF A CENTRAL MEMORY BANK CONTAIN KNOWLEDGE INSTANTLY ACCESSIBLE THROUGH TELS TO EVERY CHILD IN EVERY CLASSROOM IN THE WOR
17
17.12
THE SUCCESS OF EDUCATIONAL ENTERPRISES WILL BECOME INCREASINGLY DEPENDENT UPON CAPABILITIES FOR DATA ACQUISITION, STORAGE, ORGANIZATION, RETRIEVAL, AND DISSEMINATION.
17.15
THERE WILL BE INCREASING EFFORTS TO INTRODUCE AND EMPLOY TECHNOLOGICAL INNOVATIONS IN EDUCATIONAL INSTITUTIONS AND SYSTEMS.
17.19
MASSIVE EFFORTS WILL BE NEEDED TO TRANSLATE BASIC KNOWLEDGE AND CURRICULA INTO SOFTWARE APPROPRIAT FOR MACHINE PRESENTATION.
17.14
THERE WILL BE A NEED TO SPEED UP AND TO INTENSIFY THE LEARNING PROCESS AS KNOWLEDGE ACCUMULATES.
17.16
ACQUISITION OF LEARNING WILL BE REGARDED AS A LIFE-LONG PROCESS.
17.20
FORMAL EDUCATION WILL BEGIN EARLIER AND END LATER IN THE INDIVIDUAL'S LIFE SPAN.
17.21
MIND EXPANDING DRUGS WILL BE USED TO ACCELERATE THE LEARNING PROCESS.
(SCIENCE & TECHNOLOGY SECTOR)
(II ORGANIZATION)
ACCUMULATION OF SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE.
18.15
TECHNOLOGICAL IMPROVEMENTS IN ACCESS TO CURRENT INFORMATION AND KNOWLEDGE WILL MAKE THE STUDENT MORE INDEPENDENT OF FORMAL INSTRUCTION.
18.18
A VARIETY OF CAPABILITIES FOR EDUCATION IN THE HOME OR WORK-SHOP.
18.21
CANNED LECTURES BY EMINENT PROFESSORS VIA NATIONAL AND GLOBAL T. V.
18
18.14
A GREATER APPRECIATION OF THE CAPABILITIES OF MACHINE TECHNOLOGY TO CONTRIBUTE TO THE EDUCATIONAL PROCESS WILL HAVE TO BE TRANSMITTED TO STUDENTS -- IN BALANCE WITH HUMANISTIC VALUES.
18.16
ALL PERSONS INVOLVED IN THE EDUCATIONAL PROCESS WILL BE REQUIRED TO DEVELOP SKILLS IN MACHINE INTERACTION.
18.20
GRANTING OF DEGREES AT DIFFERENT EDUCATIONAL LEVELS AND DIFFERENT FIELDS BASED ON T. V. COURSES (EXAMS GIVEN OVER T. V.).
18.17
SHIFT FROM THE ACQUISITION OF DEVICES TO AID THE TEACHER (MOVIE PROJECTORS) TO DEVICES THAT AID THE LEARNING PROCESS (THEREBY REDUCING THE NEED FOR TEACHER SERVICES.)
18.19
THE STUDENT'S INTERACTIONS WITH MACHINES OR SYSTEMS AS SOURCES OF KNOWLEDGE WILL BE GUIDED BY SYSTEM'S SPECIALISTS.

16

16.11 CREATION AND OPERATION OF NATIONALLY SPONSORED EDUCATION PROGRAMS.

16.12 DESIGN AND DEVELOPMENT OF A NETWORK OF RELATIONSHIPS LINKING LOCAL AND STATE EDUCATIONAL AGENCIES, UNIVERSITIES, RESEARCH AND DEVELOPMENT CENTERS, REGIONAL EDUCATIONAL LABORATORIES, RESEARCH INSTITUTES, ETC.

16.13 DEVELOPMENT OF CERTIFICATION REQUIREMENTS, CURRICULA, AND MEDIA USE FOR NATIONAL ED.

16.14 COORDINATION AND INTEGRATION OF LOCAL, STATE, AND NATIONAL PLANNING ACTIVITIES.

16.15 DEVELOPMENT OF NATIONAL EVALUATION CRITERIA FOR PERFORMANCE OF LOCAL SYSTEMS AND INDIVIDUALS.

17

17.24 CREATING THE ORGANIZATION AND EQUIPPING STAFF FOR SYSTEMS DEVELOPMENT.

17.25 LONG-RANGE PLANNING, SYSTEM DESIGN, AND SYSTEM DEVELOPMENT AND MAINTENANCE FOR RECORD KEEPING SYSTEMS.

17.26 RESEARCH INTO PROBLEMS OF TRANSLATING BASIC CURRICULA INTO SOFTWARE FOR CAI.

17.27 DETERMINATION OF THE EDUCATIONAL CREDENTIALS OF THOSE WHO CREATE MEDIA USED IN EDUCATIONAL PROGRAMS: FILMS, T. V. PROGRAMS, ETC.

17.28 RESEARCH ON METHODS FOR ACCELERATING AND INTENSIFYING RATES OF LEARNING.

17.29 DEVELOPMENT OF CURRICULA FOR USE IN THE HOME FOR AGE GROUP OF 1-5 YEARS.

17.35 DESIGN, OPERATION, AND MAINTENANCE OF COMPUTER-BASED LIBRARY NETWORK AND DATA RETRIEVAL SYSTEMS.

17.34 DESIGN OF DATA REQUIREMENTS AND DEVELOPMENT OF METHODS FOR DATA ACQUISITION FOR PLANNING PURPOSES.

17.33 DEVELOPMENT OF CURRICULA REQUIREMENTS INTO SOFTWARE FOR APPROPRIATE LEVELS OF EDUCATION AND LEARNER NEEDS.

17.32 DESIGN AND PRODUCTION OF EDUCATIONAL PRESENTATIONS FOR VARIOUS MEDIA: FILMS, T. V., AUDIOVISUALS, TAPES, ETC.

17.30 RESEARCH IN THE USE OF MIND-EXPANDING DRUGS.

17.39 INSTALLATION OF NEW TECHNOLOGY INTO ON-GOING EDUCATIONAL ENVIRONMENTS.

17.37 COMPUTERIZED RECORD STORAGE, UPDATING, RETRIEVAL, STATISTICAL ANALYSIS, RESEARCH, REPORTS, ETC.

17.38 TRAINING ADMINISTRATORS IN USE OF COMPUTERIZED SYSTEMS FOR ROUTINE ADMINISTRATION, STUDENT RECORDS, ETC.

17.36 DESIGN OF A SPECTRUM OF EDUCATIONAL FACILITIES FOR MASS AUDIENCES, SMALL GROUPS, INDIVIDUALS.

17.31 CONTROL OVER THE USE OF DRUGS IN EDUCATIONAL ENVIRONMENTS.

18

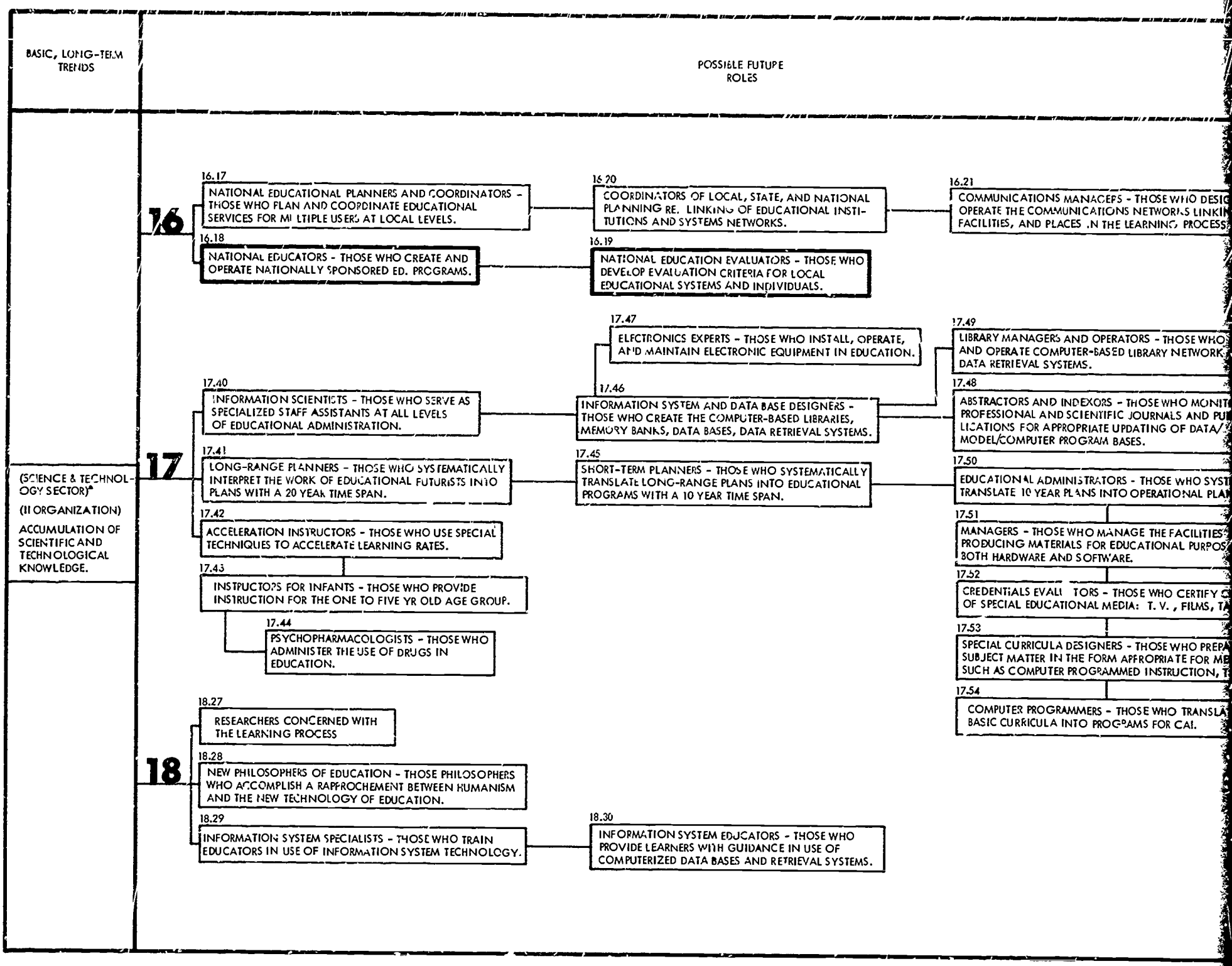
18.22 INTEGRATION OF HUMANIST PHILOSOPHY OF EDUCATION WITH NEW ELECTRONIC TECHNOLOGICAL CAPABILITIES.

18.23 EDUCATOR'S FUNCTION SHIFTS FROM TRANSMISSION OF DATA TO THE MEANS FOR ACQUIRING DATA AND IDENTIFICATION OF PROBLEMS WORTH STUDYING.

18.24 TRAINING EDUCATORS IN USE OF NEW TYPES OF SYSTEMS: COMPUTERIZED, T. V., VIDEOTAPE, ETC., FOR LEARNING PROCESSES.

18.25 RESEARCH ON EMPLOYMENT OF NEW TECHNOLOGY IN THE LEARNING PROCESS.

18.26 GUIDANCE, COUNSELING, AND SUPERVISION OF THE LEARNER'S USE OF INFORMATION SYSTEMS.


BASIC, LONG-TERM TRENDS
POSSIBLE FUTURE ROLES
(SCIENCE & TECHNOLOGY SECTOR)*
(II ORGANIZATION)
ACCUMULATION OF SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE.
16
16.17
NATIONAL EDUCATIONAL PLANNERS AND COORDINATORS - THOSE WHO PLAN AND COORDINATE EDUCATIONAL SERVICES FOR MULTIPLE USERS AT LOCAL LEVELS.
16.20
COORDINATORS OF LOCAL, STATE, AND NATIONAL PLANNING RE. LINKING OF EDUCATIONAL INSTITUTIONS AND SYSTEMS NETWORKS.
16.21
COMMUNICATIONS MANAGERS - THOSE WHO DESIG OPERATE THE COMMUNICATIONS NETWORKS LINKI FACILITIES, AND PLACES IN THE LEARNING PROCESS
16.18
NATIONAL EDUCATORS - THOSE WHO CREATE AND OPERATE NATIONALLY SPONSORED ED. PROGRAMS.
16.19
NATIONAL EDUCATION EVALUATORS - THOSE WHO DEVELOP EVALUATION CRITERIA FOR LOCAL EDUCATIONAL SYSTEMS AND INDIVIDUALS.
17
17.47
ELECTRONICS EXPERTS - THOSE WHO INSTALL, OPERATE, AND MAINTAIN ELECTRONIC EQUIPMENT IN EDUCATION.
17.49
LIBRARY MANAGERS AND OPERATORS - THOSE WHO AND OPERATE COMPUTER-BASED LIBRARY NETWORK DATA RETRIEVAL SYSTEMS.
17.40
INFORMATION SCIENTISTS - THOSE WHO SERVE AS SPECIALIZED STAFF ASSISTANTS AT ALL LEVELS OF EDUCATIONAL ADMINISTRATION.
17.46
INFORMATION SYSTEM AND DATA BASE DESIGNERS - THOSE WHO CREATE THE COMPUTER-BASED LIBRARIES, MEMORY BANKS, DATA BASES, DATA RETRIEVAL SYSTEMS.
17.48
ABSTRACTORS AND INDEXORS - THOSE WHO MONIT PROFESSIONAL AND SCIENTIFIC JOURNALS AND PU LICATIONS FOR APPROPRIATE UPDATING OF DATA/ MODEL/COMPUTER PROGRAM BASES.
17.41
LONG-RANGE PLANNERS - THOSE WHO SYSTEMATICALLY INTERPRET THE WORK OF EDUCATIONAL FUTURISTS INTO PLANS WITH A 20 YEAR TIME SPAN.
17.45
SHORT-TERM PLANNERS - THOSE WHO SYSTEMATICALLY TRANSLATE LONG-RANGE PLANS INTO EDUCATIONAL PROGRAMS WITH A 10 YEAR TIME SPAN.
17.50
EDUCATIONAL ADMINISTRATORS - THOSE WHO SYST TRANSLATE 10 YEAR PLANS INTO OPERATIONAL PLA
17.42
ACCELERATION INSTRUCTORS - THOSE WHO USE SPECIAL TECHNIQUES TO ACCELERATE LEARNING RATES.
17.51
MANAGERS - THOSE WHO MANAGE THE FACILITIES PRODUCING MATERIALS FOR EDUCATIONAL PURPOS BOTH HARDWARE AND SOFTWARE.
17.43
INSTRUCTORS FOR INFANTS - THOSE WHO PROVIDE INSTRUCTION FOR THE ONE TO FIVE YR OLD AGE GROUP.
17.52
CREDENTIALS EVALU TORS - THOSE WHO CERTIFY C OF SPECIAL EDUCATIONAL MEDIA: T. V., FILMS, TA
17.44
PSYCHOPHARMACOLOGISTS - THOSE WHO ADMINISTER THE USE OF DRUGS IN EDUCATION.
17.53
SPECIAL CURRICULA DESIGNERS - THOSE WHO PREPA SUBJECT MATTER IN THE FORM APPROPRIATE FOR ME SUCH AS COMPUTER PROGRAMMED INSTRUCTION, T
17.54
COMPUTER PROGRAMMERS - THOSE WHO TRANSLA BASIC CURRICULA INTO PROGRAMS FOR CAI.
18
18.27
RESEARCHERS CONCERNED WITH THE LEARNING PROCESS
18.28
NEW PHILOSOPHERS OF EDUCATION - THOSE PHILOSOPHERS WHO ACCOMPLISH A RAPPROCHEMENT BETWEEN HUMANISM AND THE NEW TECHNOLOGY OF EDUCATION.
18.29
INFORMATION SYSTEM SPECIALISTS - THOSE WHO TRAIN EDUCATORS IN USE OF INFORMATION SYSTEM TECHNOLOGY.
18.30
INFORMATION SYSTEM EDUCATORS - THOSE WHO PROVIDE LEARNERS WITH GUIDANCE IN USE OF COMPUTERIZED DATA BASES AND RETRIEVAL SYSTEMS.

MAJOR ISSUES

THIS LINE LEADS TO ANOTHER ITEM

16

16.22 WHAT ARE THE IMPLICATIONS OF A CENTRALIZED NATIONAL EDUCATIONAL SYSTEM FOR DEMOCRATIC CONCEPTS OF U. S. EDUCATION?

16.23 THE NEW YROK METROPOLITAN REGION CONTAINS 1400 OVERLAPPING LOCAL GUVERNMENTS. IS SUCH A STRUCTURE COMPATIBLE WITH THE EDUCATIONAL TECHNOLOGY OF THE FUTURE?

16.24 CAN LOCAL SCHOOL DISTRICTS BE RELIED UPON TO RESPOND AND ADAPT TO NEW CONTENT AND METHODS IN ELEMENTARY AND SECONDARY EDUCATION?

16.25 WILL IT BE MORE ECONOMICAL TO LINK THE STUDENT TO LEARNING NETWORKS AND SYSTEMS AT HIS HOME (PARTICULARLY IN RURAL AREAS) OR TRANSPORT HIM TO A LEARNING FACILITY?

17

17.55 HOW CAN EDUCATION COMPETE WITH INDUSTRY FOR THE SERVICES OF INFORMATION SCIENTISTS, SYSTEM DESIGNERS, COMPUTER PROGRAMMERS, HARDWARE AND SOFTWARE MANAGERS, ELECTRONICS EXPERTS, ETC.?

17.56 WHAT WILL BE THE IMPACT OF NEW TYPES OF PERSONNEL SUCH AS LONG-RANGE PLANNERS, INFORMATION SCIENTISTS, SYSTEMS DESIGNERS, ETC., ON FINANCING OF EDUCATION WHICH IS ALREADY A PROBLEM?

17.57 HOW CAN THE USE OF MIND-EXPANDING DRUGS IN EDUCATIONAL ENVIRONMENTS BE CONTROLLED?

17.58 HOW WILL FUNDS BE OBTAINED FOR NEW PROGRAMS IN ACCELERATED LEARNING, DRUG RESEARCH AND USE, DEVELOPMENT OF CAI, CREATION OF COMPUTERIZED LIBRARIES AND DATA RETRIEVAL SYSTEMS?

17.59 HOW, WHERE, AND WHEN AND BY WHOM WILL EDUCATIONAL PLANNERS, ADMINISTRATORS, AND MANAGERS RECEIVE THEIR TRAINING FOR THE NEW EDUCATIONAL TECHNOLOGY?

18

18.31 HOW CAN EXISTING INSTRUCTIONAL PROGRAMS BE TRANSFORMED SO AS TO DEVELOP SELF-LEARNING ATTRIBUTES AMONG STUDENTS?

18.32 HOW CAN TRADITIONAL HUMANISTIC PHILOSOPHY BE RECONCILED WITH ELECTRONIC TECHNOLOGY?

18.33 WHAT IMPACT DOES A GREATER DEPENDENCE UPON TECHNOLOGY IN INSTRUCTION PROCESSES HAVE UPON TEACHER RECRUITMENT, SELECTION, VALUES AND ATTITUDES?

18.34 IF THE NEW EDUCATIONAL TECHNOLOGY PROVIDES MORE FREEDOM FOR THE INDIVIDUAL LEARNER TO PROCEED AT HIS OWN PACE, HOW WILL THIS AFFECT PROBLEMS OF DISCIPLINE AND ORDER IN URBAN ENVIRONMENTS?

18.35 HOW CAN EDUCATIONAL SYSTEMS ACQUIRE INFORMATION SYSTEM EDUCATORS? RECRUIT FROM THE OUTSIDE OR TRAIN FROM WITHIN?

18.36 WILL THE PROFESSIONALIZATION OF THE LIBRARIAN'S ROLE BE NECESSARY IF THE TEACHER'S ROLE ENCOMPASSES THE FUNCTION OF INSTRUCTION IN USE OF DATA RETRIEVAL SYSTEMS?

18.37 HOW, WHEN, AND WHERE ARE THE EDUCATORS TO BE TRAINED AND KEPT UP-TO-DATE ON NEW TECHNOLOGY USEFUL TO EDUCATIONAL PURPOSES?

18.38 HOW SHALL CURRICULA FOR EDUCATORS ON SUCH SUBJECTS AS INFORMATION SCIENCE, SYSTEM DESIGN, AND EDUCATIONAL TECHNOLOGY BE INTRODUCED INTO THE TEACHER'S COLLEGES?

APPENDIX F

SEMIAUTOMATED DATA BASES
IN THE
EDUCATIONAL POLICY RESEARCH CENTER

by

Jack Jaffe

INTRODUCTION AND THE TIME-SHARING SYSTEM

One of the possible functions of the EPRSC is to provide some information-handling services to a heterogeneous set of users. This working paper will describe the initial attempts towards the establishment of two computerized data bases for use both by the core staff and other Center users or visitors. It will also discuss briefly how the specific computer programs that generate these data bases can be used by non-programmers to define and compile other data bases quickly and easily.

It is important to distinguish between these two uses of the computer program system. On the one hand, a set of data categories has been defined and data are already being obtained and stored by EPRSC. On the other hand, the same computer programs have the ability to provide the tools to describe, store, and retrieve other data bases. In both cases the program system is such that more than one user can be interacting with it simultaneously, a characteristic of time-sharing systems. Before going on to the description of the data base programs and the description of two current uses of it, one needs to understand first something about time-sharing as it operates at System Development Corporation.

Time-sharing essentially means that several different computer programs can be operated more or less simultaneously under the control of an executive program that sequences them through a central computer in a continuous loop until given instructions to stop. The major advantage in the use of such a system occurs primarily when the programs being cycled through the central computer require a large number of inputs from a user; these inputs can either be data or additional instructions. Since such programs spend relatively little time in calculation, and much more time awaiting inputs from a user, the central computer can be used most efficiently by servicing a number of such programs one right after another, stopping to process each one in turn for a very short period of time. As far as the users are concerned, the processing is almost instantaneous but in fact each program in the loop may have only a few hundred instructions executed during its turn in the computer.

In terms of physical arrangement, typewriters (teletypes actually) connected to the time-sharing computer (AN/FSQ-32) can be almost anyplace. There are perhaps thirty scattered around SDC in Santa Monica, one at University of California in Berkeley, one in SDC's Washington, D.C. office, and so on. One can then either compose his own program at the teletype, call for a program he has previously written and stored on magnetic tape at the computer facility, or call for one of the standard "library" programs; the system we are going to describe for handling data bases is one of the latter. Time-sharing possesses additional features such as giving the person at the teletype a list of legal commands that he can use in communicating with the system, giving a user meaningful error messages when he communicates incorrectly with the system, and so on. In short, while time-sharing is an executive program that controls the sequencing

of other programs through the computer, it also is a "mechanism" that allows relatively inexperienced people to use data processing facilities by interacting directly with their programs while they are in operation.

THE LUCID SYSTEM

The "library" program that is currently being used by EPRC is called LUCID which is an acronym standing for Language Used to Communicate Information System Design. LUCID really is a set of programs that enable one to define, store, process, retrieve, and output sets of data. LUCID operates under the control of the time-sharing executive on the Q-32 computer. Primarily, we are concerned with the operation of three sub-programs within the LUCID system. By using these three one can first define the types of contents of the data, then load the actual data into the computer for "permanent" storage on magnetic tape, and finally call for the data selectively from the data base and have them displayed.

LUTRAN is the sub-program that enables a user to define his data base, that is to describe the kinds of items they are and to assign names to them. LUTRAN also allows modifications of an existing description to be made. Rather than illustrate with an hypothetical example, let's use a bibliography to show what the parts of LUCID do. In this case, the data base is a bibliography, a listing of a set of documents with some characteristics of documents described for each member of the set. For each document, for instance, the following types of entries are customary: a title, author, publisher, year of publication, place of publication, and if the document is an article from a periodical, then the periodical name, volume, issue, page numbers, and so on. If one wants to construct a bibliographic data base using a computer and LUCID, one would first use the sub-program LUTRAN to describe to the program what each one of the above entries is and what it is called. Computer programs have to have "names" for entries and so, when one wants an author as part of a citation one has to say that AUTHOR is entry number x. Similarly for all of the other entries in the bibliographic citation form. Entry number y will probably be TITLE, and so on. LUTRAN therefore forces the user to give names to all of his entries, and numbers as well, although subsequently the program can operate on entries out of order provided they are numbered.

LUTRAN requires a second very important kind of definition of an entry besides its name, and that is the kind of entry it is. Is it a number, a name, or what? Since computers deal only with numbers, the programs have to be told when the numbers represent other things like letters of the alphabet. LUTRAN will allow the following types of entries, each one with its own unique characteristics:

NAME — For our purposes this will be the most commonly used type of entry. Authors, titles, publishers, etc., are all NAME entries. Practically what this means is that the program

will accept almost anything in any entry that has been defined as a NAME entry, even numbers, and punctuation. But, as will be described later, if the user wants to sort through the data base on the basis of a NAME entry he will have to be sure that he uses exactly the same form and spelling as was used in making the entries in the first place. For instance, if one wished to find all the books in the data base published by Wiley, and if he had entered "Wiley and Son" for several at the time that he "loaded" the data base into the system, of the citations only the ones where he had entered "Wiley" would be retrieved; the others would still be stored by the program but the user would specifically have to ask for "Wiley and Son" to get them. Needless to say, "Wiley & Son" would not work either. However, at the moment we are trying to show how the data base is defined, and we will leave till later the discussion of retrieval.

INTEGER or DECIMAL

Entries may be numbers but the user must specify whether they are going to be integers or decimals. If it is suspected that decimals may be used at some time in the future, then the entry should be so defined because decimal entries can include integers but not vice versa. In our data bases only integers are used, for instance the year of publication of a document. By having this a number (integer) one can then ask for a sort of an existing data base by year, for instance all documents published in or after 1960.

CATEGORY

Categories are like NAMES except that only the names given to the categories, when the data base is defined, will be accepted as legal. For example, if one wants as part of the citation the information as to whether or not the document contains a bibliography, one can define a CATEGORY entry whose name is BIBLIOGRAPHY and whose categories are YES and NO. Then, when the data are loaded, either a YES, NO, or blank would have to be entered. A "maybe" would not be accepted.

STRING

Entries may be strings, that is, there may be more than one item in an entry, as in the case of multiple authorship. The reason for defining the entry as a STRING is that when it comes time to search the data base for a specific author, only those citations will be found that have his name as a separate entry or as a member of a string. If two or more names are put together in a single entry, which is legal, those citations will not be retrieved if they are requested on the basis of a single author's name.

STRING SETS These are like strings except that there may be sub-entries under each member of the string that further describe the main entry. For example, for each author in a string we might also want to know past organizational affiliation, present organization, discipline, and school. By putting these in a string set one can sub-set inputs and outputs efficiently, relating the sub-set to a particular member of the string. This is a confusing notion, partly because the same thing can be obtained by defining a separate numbered entry for each member of the string and for each item in the subset. However, from the point of view of data storage and search time, the latter alternative would be extremely inefficient as well as confusing when output. The user would have to construct a mental table to associate the sub-set items with the corresponding string entry.

After each entry is completely described with a name, number, and entry type, the data base description is translated by LUTRAN into machine language and stored "permanently" on a separate tape where it can be modified if necessary at any time. Then, when the data base is actually loaded into the system, the description must be present in the computer.

LODA is the sub-program which takes the data from the user, translates them into machine language in terms of the definitions stored by LUTRAN, and writes a "permanent" record of the data on a magnetic tape. The tape produced by LODA contains the actual data base and is what is requested by the user whenever he wants to retrieve some data. LODA will allow new entries to be added to the data base so that existing data bases can be expanded. (There is another sub-program, called MERG, that will allow two separate data bases with the same form to be merged into one.) The program will accept data from either punched cards, which must first be pre-stored on a magnetic tape, or from the teletype, or from a file already stored in the computer (disk). If only a small number of entries is to be made, teletype would be the most convenient input.

QUUP, an acronym for Query and Update, is the major sub-program and the one most likely to be used. As its title implies, it serves two functions. The primary function is to permit a user to ask questions of his data base, have the program process the data base (sort and simple arithmetic), and display the results, usually on the teletype. The other function is to allow a user to change parts of entries, in contrast to LODA which has to be used to input entire entries. QUUP allows a number of different kinds of queries to be made and has a few options for displaying the results, but actually it does not allow very much variation in output format. It can arrange output alphabetically if the user gives it the element number on which to alphabetize, for example, on the element named AUTHOR. When it outputs, it can either print the entirety of each entry that is retrieved or only parts of it specified in the query.

As far as queries are concerned, they generally take the form of Boolean statements: PRINT WHERE AUTHOR EQUALS (KEPPEL F) AND SUBJECT EQUALS (ROLES OF TEACHERS) AND YEAR GQ 1960.* This input to QUUP from the teletype asks the program to print each entry in its entirety that has Keppel F. as its author, that deals with teacher roles, and that was written in 1960 or later. Since these were AND statements, only entries that satisfy all three conditions will be printed. There are also OR statements. For instance, we could have asked for the same thing except that we could have replaced (ROLES OF TEACHERS) with (ROLES OF TEACHERS) OR (ROLES OF EDUCATORS). In that case we would have gotten anything written by Keppel, during or after 1960, and dealing either with teacher roles or educator roles. Many combinations of AND and OR can be put into a single query. One can ask the program simply to count the number of entries that fulfill a given set of conditions or to describe the complete set of items that go to make up each entry, that is to give the user back his data base description in case he has forgotten it. It would serve little at this point to give a complete description of all the querying capabilities of QUUP but there are user manuals for all modules of LUCID that do contain all relevant details.

Before going on to a description of the data bases we have begun to generate using the LUCID system, we might point out that certain features of the system are there more because of programming considerations than others. For instance, the distinction between numbers that are integers or decimals is strictly to save time and space in the computer since, as far as the user is concerned,he could declare all numbers decimals and get the same results from the program.

THE "BIBLIOGRAPHY" DATA BASE

On an experimental basis EPRC has started to automate its expanding bibliography using the LUCID system run under time-sharing. This is a relatively simple-minded bibliography that is designed more to provoke discussion and comment than to establish a fixed mode of operation. Hopefully we will discover whether it is considered useful to provide such a specialized and do-it-yourself service and if so, how it can be done better. We are aware of the facts that library science is advanced well beyond what we are doing and that there are numerous other bibliographic services available right now, as for instance, from the Education Research Information Centers. However, the idea is to try to develop not only a very specialized bibliography, and bibliographic do-it-yourself service, but also to try to integrate bibliographies with the content and process of policy research and education futures. Perhaps in discussing some of the key items in our two data bases the meaning of integration may emerge, limited somewhat by our inability to formulate the concepts of an integrated program at this time.

Each entry into the data base can be described by as many as twenty-two numbered items. At no time do all of the items have to be used; if some information is lacking, the entry can still be made and added to at any later date using QUUP. An entry is defined as a bibliographic unit such as an entire document, or a

*GQ stands for greater than or equal to.

discrete part of a document such as a chapter from a book. For a collection, for instance, that has twelve individually contributed chapters there may be as many as thirteen entries, one for each chapter and one for the document as a whole. An item is a numbered part of the entry, SENIOR AUTHOR, for example, always being item #3. A sample work sheet is shown on the next page followed by a list of the twenty-two items and their explanations.

A very small set of SUBJECT names and their corresponding descriptors is also shown following the explanation of the items constituting a bibliographic entry. This is included simply for purposes of showing how words keying the substantive content of a document might be used as a basis for organizing a search of the data base. We expect to modify and greatly enlarge this list of terms as more entries are added to the data base and as more people use the system, telling us how they prefer to search and what terms are meaningful to them in a particular context.

29 February 1968

IM-3645/004/00

"BIBLIOGRAPHY" DATA BASE WORKSHEET

CITATION NUMBER	1				
DOCUMENT TYPE	2				
SENIOR AUTHOR	3				
OTHER AUTHORS	4		4		
	4		4		
TITLE	5				
EDITOR	6		6		
COLLECTION/ PERIODICAL TITLE	7				
PUBLISHER	8				
SUMMARY	9				
CITATION	10				
YEAR	11				
SUBJECT TREATMENT	12				
QUANTITATIVE DATA	13				
BIBLIOGRAPHY	14				
FORECASTING METHOD	15				
METHOD DESCRIPTION	16				
SUBJECT	17				
DESCRIPTORS	18		18		
	18		18		
	18		18		
	18		18		
LIBRARY	19	19	19	19	
SERIAL NUMBER	20	20	20	20	
COMMENTS	21				
SPECIAL TITLE	22				

"BIBLIOGRAPHY" Data Base Entries
(Instructions and explanations for filling out the worksheets)

1. Citation number — Enter an Arabic number; documents require numbers that are unique so do not repeat a number although numbers may be skipped. These numbers normally are assigned to documents as they are logged into the EPRC library. Numbers must still be assigned even if the document is not in the library.

2. Document type — Enter one of the following:

Periodical - whether part of a regular series or irregular; include newspapers

Book

Catalogue

Monograph - whether regular series, irregular, or separate

Pamphlet - a self-contained document, not part of any kind of series

Commission Report - regular, irregular, or separate

Project report - usually one of a limited number issued by a technical group that is not called a "commission"

Organization Series - SDC papers, Aeromedical Laboratory reports, etc.

If none of the foregoing apply readily, invent a term, use it, describe it, and then record it so that it may be considered for inclusion as a permanent category.

3. Senior author — Enter the name of the first author in case of multiple authorship, or the most well-known one of the group. Always enter the last name first, then a space, then the initials separated by another space if there is more than one, e.g., (Jones A W). Always enclose the name with parentheses. As a matter of fact, whenever there is more than one word, an initial counts as a word, the words must be enclosed in parentheses. If the document is a collection of the work of several authors, and if the bibliographic entry concerns the

work as a whole, then there will be no entry under numbers 3 and 4. Instead, the name(s) of the editor(s) will appear under number 6. If the bibliographic entry is the chapter or report of an author or authors within a collection, then there will be an entry under both author and editor.

4. Other authors — Enter the name or names of all other authors under the rules stated for number 3. If there are more authors than space is provided for, either write in the extra names, each one preceded by the number 4 outside of the parentheses, or else omit some. This is an unlikely case, however, since the form provides for a total of five authors.

5. Title — Title only, always enclosed in parentheses. If there is a significant sub-title, consider putting it in item 22, Special title. Again, if a collection of works, in distinction to one of a collection, is the subject of the bibliographic entry, put the title under item 7.

6. Editor — Enter the editor(s) name(s) regardless of whether the entry is the collection as a whole or just one of the works in the collection. If there are more than two editors, add their names preceded by the number 6. Again, don't forget the parentheses. The editor of a collection is sometimes an organization; put the organization name in, in that case, using parentheses and normal word order, e.g., (Look magazine).

7. Collection/ periodical title — Enter collection title if item is a collection or enter periodical title if item is an article from a periodical, including newspapers. Use parentheses if more than one word is involved.

8. Publisher — Enter publisher name except in the case of periodicals. Many reports are published by government agencies and it is appropriate to list the agency as the publisher. Also enter the location of the publisher; enclose entire entry in parentheses.

9. Summary — Enter Y for "Yes" if the document itself contains its own summary. (Later this entry may be used to indicate whether a summary exists in the EPRC files.) Enter N for "No".

10. Citation — For periodicals, enter Volume, Issue, Month, and the pages on which the article can be found. Enclose in parentheses.

11. Year — Enter the year in which the document was published.

12. Subject treatment — Describe how the substantive material of the document is treated primarily. (If you want to qualify your description, enter something under item 21, Comments.) Enter one of the following names under item 12:

Fiction; Essay; Research; Conference (includes seminar, symposium, panel, and other forms of group presentation); Survey; Textbook; Speech; Bibliography; Catalogue. If none of these terms seems to fit well enough, invent a term, use it, describe it, and then record it so that it may be considered for inclusion as a permanent category.

13. Quantitative Data — Enter Y for "Yes" if the document contains any significant, or significant amount of, quantitative or statistical data. (We realize this is a matter of judgment.) Enter N for "No".

14. Bibliography — Enter Y for "Yes" if the document contains a labelled bibliography. It may become difficult to distinguish between a large set of references and a bibliography. If there are a number of references, and if they are collected in one place, instead of in footnotes, you might consider calling that a bibliography. Enter N for "No".

15. Forecasting method — Enter the name of the forecasting method used if the document deals at some length, e.g., an entire chapter, with a forecast, or forecasts, of the future. A list of the names we have used so far is attached, together with a brief description of the method.* Again, if you want to use a different name because nothing in the existing list is suitable, use it, note, it, etc.

16. Method description — If item number 15 has an entry, that is, if a forecast has been made using a particular forecasting method, then enter a Y for "Yes" if the author has described the forecasting method in some detail, or has shown how he used it in detail. Enter an N for "No" if there is no such description.

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* See pp A-8 to A-12 of Appendix A.

17. Subject — Enter the name of the major subject of the document; other subjects will be accounted for in the next item. Refer to the attachment for an initial list of subjects. Sometimes it is difficult to separate the subject matter from the method and form with which it is considered; however, we do have separate categories for the latter, as you have already seen. The current subject list will, without any doubt at all, be revised, and never to the satisfaction of all. Feel free to add to the list, note your additions, etc. Try to make the subject names broad, but not so broad that when a search is made 95% of the titles will be nondescript.

18. Descriptors — Enter terms which will help to elaborate on the subject, spelling it out in more detail. Some suggested descriptors are listed on the same attachment as the subjects since conceptually there is no real distinction. We have tentatively used a separate item for subject simply as a convenience in searching. Eventually a "thesaurus" of descriptors will be compiled, as in the Education Research Information Centers. Therefore add, note, etc. Use as many descriptors for an entry as appropriate to describe significant elements of the content of the document. As a quick guess, probably twelve descriptors should be adequate, if not fewer. Fewer than three might well be inadequate.

19. Library — Enter the name of the location from which the document is available. Generally this might be limited to the following: Educational Policy Research Center; SDC library; Defense Documentation Center; ERIC. Other centralized or specialized libraries and collection agencies might be mentioned. Otherwise there probably is little benefit to be gained from listing general libraries.

20. Serial number — For each library mentioned in item 19, put the library's unique acquisition number. If there is more than one library, put in the serial numbers in the same order as their corresponding libraries.

21. Comments — Anything else of particular use, or qualification of previous entries. Limit comments maybe to ten or twenty words and again, don't forget the parentheses.

22. Special title — Enter a sub-title if important, or some special item such as a conference name that gave rise to the document but that doesn't appear in the title.

BIBLIOGRAPHY DATA BASE--LIST OF SUBJECT AND DESCRIPTOR NAMES

Major heading tentatively equivalent to SUBJECT

Sub-headings tentatively equivalent to DESCRIPTORS

Education process

- Educator roles
- Education technology
- Learning
- Student Roles

Education futures

- Education locations
- Age groups
- Special populations
- Education change
- Curriculum

Education policy

- Educational objectives
- Educational goals
- Values
- Priorities
- Planning

Education finances

- Budgeting
- Taxes

Education general

Technological change

Social change

Forecasting methodology

Long range planning

Policy making

- Decision making
- Evaluation
- Dissemination
- Implementation

LIST OF SUBJECT AND DESCRIPTOR NAMES (cont'd.)

Education and law

Social theory

Organization theory

There are some minor problems in filling out the worksheets that reflect some uncertainties about the documents themselves. These will be mentioned briefly in order to indicate that we are striving to reduce ambiguity to a minimum.

Item No. 2 DOCUMENT TYPE

This is not a rigorous classification but is intended to provide some picture of the physical nature of the document. One can, for instance, quarrel with inclusion of the term "catalogue". This can also be a book or pamphlet so our categories are not mutually exclusive. Yet to know that something is a catalogue gives some physical impression as well as saying something about the substantive contents. We may decide later that this should be dropped as a document type and retained as a category of subject treatment.

Item No. 3 SENIOR AUTHOR

The first author may not always be the senior author so there is a choice of putting a familiar name as the senior author. However, in general books and articles are referred to by the first author's name.

Item No. 6 EDITOR

We have encountered books that are true collections, with each chapter written by a different author, and yet the publisher has listed an author of the book instead of an editor. One must abide by the publisher's decision and perhaps under COMMENTS we can insert a statement about the true nature of things.

Item No. 12 SUBJECT TREATMENT

There is an attempt here to make mutually exclusive categories. Nevertheless there are always problems in defining "research" and separating it from expert opinion and so on. Hopefully the term "essay" will be used appropriately to include all interpretive compositions written from a personal point of view.

Item Nos. 17 and 18 SUBJECT & DESCRIPTORS

Conceptually there is little difference between the two; a subject could just as well be listed in the descriptors item. From the point of view of retrieval, however, if a user of the bibliography wants to find material that is treated at length, he would search on the basis of SUBJECT. Otherwise, the search would include entries that the abstractor felt might be faintly relevant. By forcing the abstractor to find the nucleus of the subject matter, we make the search easier for the user. If the user feels that he does not want to trust the judgement of the abstractor, he is always free, obviously to browse through the document or look at the DESCRIPTORS; but to make an initial search easier one must depend on the judgment of others. The ERIC Thesaurus of descriptors is being consulted to assure that there is comparability where such is justified by the nature of the content, but more to determine whether there is truly some unique subject matter for the Center's bibliography.

Item No. 19 LIBRARY

Only four libraries that may house the document are being included. Two of them are directly accessible to people at the Center, and the Defense Documentation Center and ERIC have convenient, extensive services for obtaining relevant material. Otherwise, one might just as well order the document from the nearest appropriate library.

THE "METHODS" DATA BASE

This is truly an experimental data base that has been defined and redefined a number of times already. Entries in the base consist of documented instances in which a forecasting method has been applied to the problem of predicting societal futures in general and educational futures specifically. Construction and manipulation of this data base is being done in parallel with the Center's study of forecasting methodology. Although in a sense one of the purposes of the Center as a whole is to foster creative thinking about the future of education, it might be suggestive to see how other people have used various methods, particularly some newly emerging ones like the Delphi technique and cost-benefit analysis, and judge not only whether they may be applicable but also whether some new applications might be found. And, given a conceptual framework of some sort to limit the field, one might be able to determine whether a new method has to be "invented" to fill a particular need within the given framework. Hopefully, as methodological data accrue either from direct investigation at the Pilot Center or indirectly through pursuit of substantive material, one would be able to think more systematically about what makes the choice of method for forecasting appropriate or inappropriate.

A conceptual framework for initial contemplation of methods has been developed, or rather adapted from John Dewey; this is reported by P. Rosove in his working paper on methodology. One can think of the problem-solving process as having a structure, and indeed many investigators have seen evidence of similar structures. The structure consists of five parts, called problem-solving stages: (1) identification of problem. Dewey actually says, in substance, that the first stage is recognition of a felt difficult; (2) analysis of the problem; this obviously includes, but is not necessarily limited to, collection and reduction of data; (3) synthesis, but whether necessarily of data or ideas generated by analysis is not quite clear. Synthesis might be extended to mean the formulation of solutions to the problem; (4) evaluation of possible solutions, presumably in terms of some criteria that have already been made explicit; and (5) judgment or selection after evaluation, presumably absorbing the remaining uncertainty or invoking some additional criteria that are strictly private. Other thinkers have formulated the problem-solving process somewhat differently or else named it differently. For instance, Lindbloom and Braybrooke (A Strategy of Decision, The Free Press, New York, 1963) have called it the "synoptic method". There is no need at this point to dwell on divergences. It is mentioned only to indicate that the study of methods within a conceptual framework, if it is to yield any usable results, must also take into account the particular problem-solving process a user has in mind. Substitute the phrase "policy analysis" for problem-solving and the relevance of the present discussion should become clearer.

In any event, we have provided an item in the "Methods" data base to cite the stage of the problem-solving process to which the method has been applied. In a sense it is the primary item although other useful information about the methods applied is included. A preliminary version of the worksheet follows, then a description of the items composing an entry, and finally, as before, a brief discussion of some of the problem items.

"METHODS" DATA BASE WORKSHEET

SERIAL NUMBER	1					
METHOD NAMES	2		2		2	
INVESTIGATOR(S)	3		4			
	3		4			
	3		4			
CITATION NUMBER	5					
SOURCE TYPE	6					
ACRONYM	7					
PROBLEM-SOLVING STAGE	8		8		8	
FORECAST TYPE	10					
PROCESS TYPE	11					
APPLICATION AREA	12		12		12	
FEEDBACK	13					
TIMESPAN	14					
COMPUTERIZED	15					
TRANSFER DIMENSION	16					
MANPOWER COSTS	17					
FACILITY COST	18					
EQUIPMENT COSTS	19					
COMMENTS	21					

"METHODS" DATA BASE WORKSHEET

(Explanation and Instructions for Filling Out)

1. Serial number	Enter an Arabic number. These must be sequential. Keep a list. Check with Perry Rosove. No leading zeroes.
2. Method names	Enter up to three names; all three on same line. If a method name has two or more words in it, don't forget parentheses, e.g., (time series).
3. Investigator(s)	Enter last name first and then initials; each investigator for the same application on a separate line. If no investigator, leave blank and enter an organization name under entry #4. Space between name and initials but no punctuation. Enclose in parentheses. If there is more than one investigator and the organization of one or more of them is not known, enter none where the organization name normally would go.
4. Organization	Enter, for each investigator, his organization at the time of publication. Be sure that organization names, when repeated, appear in identical form. For example, do not use SDC at one time, System Development Corporation at another and System Development at still another.
5. Citation	Leave blank at present. This will be used to refer to the entry number in the "Bibliography" data base which cites the document that reports the use of the method.
6. Source type	Enter either P for Primary or S for Secondary depending on whether you read the investigator's own account of the application or somebody else's recounting. T can be entered for a tertiary source.
7. Acronym	Enter the acronym for the method, e.g., PATTERN, for the Honeywell application of a modeling technique.
8. Problem-solving stage	Judge whether, in the specific application, the method has been used to Identify problems, Analyze data, Synthesize data, Evaluate data or alternatives, Judge values, data, or alternative solutions. Enter: Ident for Identification of problems Anal for Analysis of data Synth for Synthesis of data Eval for Evaluation of data or alternatives

Judg for Judgment of status or value

and

append, without leaving a blank space either a 1, 2, or 3 depending upon whether the application was used primarily (1) for that stage, secondarily (2), or could reasonably be used (3).

For example, an application of a math model would be coded Synthl since such models derive their power from being able to show the results of the dynamic interactions among a number of single variables.

9. There is no number 9 at present. This is a dummy.

10. Forecast type — Enter Norm for normative or Explo for exploratory.

11. Procedure — Decide whether the method itself consists primarily of mathematical manipulation of data (e.g., models) or logical or non-mathematical manipulation. Enter Quan if mathematical or quantitative or Qual of non-mathematical or qualitative. Enter Mix if both, e.g., Delphi technique. Leave blank if undecided.

12. Application area — Enter a name such as: Education, Demography, Technology, Political Structure, etc. If it can be subcategorized, do so. For example, enter Education, Educator Roles, Teachers if this can be determined.

13. Feedback — Enter Y if the method has provisions for feedback built in; N otherwise.

14. Timespan — Enter the number of years into the future the forecasting method looked in this application.

15. Computerized — Enter Y if a computer was used, N if one wasn't, or UD if one is under development.

16. Transfer dimension — Enter V for vertical, H for horizontal, B for both, or U for undecided.

17. Manpower costs — Enter an Arabic number, no leading zeroes, representing the man-months involved in adapting and using the method

18. Facility costs — Leave blank

19.	Equipment costs	Enter an Arabic number, no leading zeroes, representing the number of thousands, e.g., 5 hrs of 7090 computer time @ $10/min, enter 3 which stands for 3,000.
20.		There is no number 20 at present. This is a dummy.
21.	Comments	Any comments at all that are printable, for instance special costing factors, other organizations that are rumored to be using a certain method, etc.

A brief discussion of some of the problem items follows:

Item No. 2 METHOD NAMES

Since this is a NAME item, rather than a CATEGORY within the LUCID system, any name can be used. P. Rosove in his working paper deals with the problem of defining methods and lists some twenty-one that he wishes to consider. Certainly the abstractor should use those first, then add modifiers if necessary, and finally create new method names where appropriate. This is part of the continuing dialogue at the Center and the data base can accommodate to it very well, even keeping a record of changing terminology.

Item No. 10 FORECAST TYPE

Jantsch, in his book on technological forecasting methods, distinguishes two types of forecasts, normative and exploratory. Normative forecasting is based on wishes, desires, objectives, and the like; what ought the future to be like. Exploratory forecasting or the other hand takes off from the past or present data and extrapolates; classically econometrics is of this type. Whether or not these are simply discriminable parts of the same continuous process, it might be helpful to see whether this distinction will stand up because the Center has as another one of its objectives the determination of ways in which normative forecasts and exploratory forecasts can be made to merge over a period of time with the end result of biasing the exploratory toward the normative.

Item No. 12 APPLICATION AREA

Even more so than in the case of method names, we want to "grow" a list of application areas. About what substantive aspect of society was the method used to make forecasts? As yet we have no good way of even suggesting anything other than what is shown. However, the more specifically the area is named, the more useful the item will be.

Item No. 13 FEEDBACK

The Delphi technique of Helmer is an example of feedback built in. Experts make judgments about when an event will occur, give their reasons, exchange them, and then revise their estimates in an attempt to reach consensus. Probably a recursive model could be said to have feedback built in.

Item No. 16 TRANSFER DIMENSION

Jantsch, in his work on technological forecasting, presents a broad scheme within which to determine whether that which is being predicted represents a transfer (presumably from the past and present) vertically or horizontally in society. The vertical dimension represents transfer through "levels" of society, eight in all, ranging from scientific resources, through applications and social systems, to implications for society as a whole. (In a sense McLuhan's message on "media" in The Gutenberg Galaxy is that of a far-reaching vertical transfer.) Jantsch's horizontal dimension defines transfer of a less profound nature, from empirical theory, through product development and application in other industrial sectors, to use by elements of society for achieving specific social goals. But it does not transfer to social systems nor impact on society as a whole. Jantsch's thinking is somewhat less than lucid on these dimensions but there seems to be some utility in distinguishing forecasting methods on the basis of their extent of impact.

Items Nos. 17, 18, and 19 COSTS

These will probably all be left blank for the present. At some time in the future, as more experience with forecasting is gained, perhaps one will be able to distinguish among methods on the basis of cost.

APPENDIX G

A SYSTEM APPROACH TO POLICY MAKING

by

Jack Jaffe

29 February 1968

TM-3645/004/00

A SYSTEM APPROACH TO POLICY-MAKING

This staff paper is an attempt to show how the policy-making process might be assisted by employing some of the concepts of systems analysis. Figure 1 is a schematic version of related activities that exemplify a systems analysis of a policy issue. The major portion of this paper will try to make the processes portrayed in the diagram somewhat clearer than they appear to be at first glance.

Before proceeding with the explanation of the diagram, it might be best to explore briefly what is meant by assistance for the policy-making process. The policy-making process is defined for present purposes as the focused and relatively long-term deliberations of a group that has administrative functions within an organizational context, government, industry, etc. Such groups typically look at issues from the point of view of providing guidance to other groups or individuals who are going to have to take some sort of action to solve problems arising from the issue.

We have chosen to use the issue of compensatory education in the figure as an example. The policy-making process would consist of further refining the issue, determining whether it is a real issue that should be pursued further, making some determinations as to where the "public" welfare lies in regard to the issue and related ones, breaking the issue down into parts that would lead to the formulation of possible studies, formulation of programs that might resolve the issue if they were to be carried out, and finally making recommendations to an executive power. Assistance to this kind of process would take essentially three forms. First, it would involve obtaining agreement as to the nature of the policy-making process. Figure 1 represents merely one of a large number of ways the process could go. The analysts themselves would have to consider those processes suitable for them. Next, it would involve assistance in providing appropriate data for the analyses and structured ways in which those data might be utilized, by modeling, for example. Thirdly, it would involve observation by the center of the analysis process in progress, and feedback to the analysts of information about where they've been and how they've done.

Bearing in mind that Figure 1 depicts only an example of how system analysis might be applied to assist the policy-making process, let us briefly go through the blocks in the diagram, each of which represents a set of activities, and show some of the interrelationships.

Blocks 1, 2, and 3

These blocks represent three possible starting points for the policy-making process that is based on the systematic study of the future. (There are other ways by which the process can start if it is not oriented to the future.) Essentially Block 1 states that community interaction can provide normative data to start focusing the deliberations. By normative data, we mean statements

START***
(COMMUNITY INTERACTION)

NORMATIVE EDUCATION PROJECTIONS: COMPENSATO

START *** (EXPLORATORY)

NORMATIVE PROJECTIONS (1)

A. DEVELOPMENT OF RELEVANCE TREES

B. "ECONOMIC" ANALYSIS OF "WANTS"

C. DELPHI ANALYSIS

AUXILIARY NORMATIVE FORECAST (11)

INCREASE EDUCATIONAL QUALITY

TRENDS (FROM

FROM CONT
ECONOMETR
SCENARIOS,
TRENDS IMPL
ROLES. ANA
ACCORDING
WHICH THEY

ANALYSIS OF POTENTIAL PROGRAMS (10)

1. IDENTIFICATION OF SCARCE RESOURCES (e.g., MONEY, TIME) AND DETERMINATION OF THE "PARETO-OPTIMUM" POINT
2. ANALYSIS OF INCREMENTAL MARGINAL UTILITY OF PROGRAMS

TASK ENVIRONMENT (12)

1. CREDENTIALING REQUIREMENTS (PROBLEM OF FORMAL vs "EQUIVALENT" QUALIFICATIONS)
2. CURRICULA CHANGES

SELECTION OF EDU

1. DIAGNOSTICIAN -
SPECIALIZATION W
A. ABILITY
B. ACHIEVEMENT
C. REMEDIAL DEFI
2. COUNSELOR (OR C
A. PSYCHOMETRIC
B. REMEDIAL TEAC
C. "PURE" COUNS
D. COUNSELLING
E. ADVANCE PLAC
3. COMMUNITY RELAT
4. CLASSROOM TEACH
A. PACING SPECI
B. MEDIA COORD
C. DISCIPLINARIA
5. CURRICULUM DEVEL
A. LESSON PLANN
B. INSTRUCTIONA
PHONE)
C. GAMES (GRAD
"VALIDATE" M
6. REMEDIAL SPECIALI
ALSO "HARD CORE
7. TEACHERS OF EDUC

BALANCE DEVELOPMENT PROGRAMS (13)

LEGAL AND EXECUTIVE CODES

RELATIVE UTILITY

DEVELOPMENT OF DECISION-AIDING DATA (9)

1. DEVELOPMENT OF PROGRAM TIME-LINE ANALYSIS TO DETERMINE LEAD TIMES
2. DEVELOP FAMILIES OF SUPPLY (AND DEMAND) CURVES ON THE BASIS OF LEAD TIMES AND OTHER KNOWN FACTORS LIKE ATTRITION AND ENROLLMENT

POLICY ALTERNATIVES (14)

LISTS OF ALTERNATIVE PROGRAMS AND THEIR VALUE

FURTHER DISCUSSION & PLANNING FOR THE "BACK HOME" ORGAN-IZATIONS

EPRSC PROGRAM EVALUATION

*** STOP

ANALYSIS OF EDUCATOR DEVELOPMENT PROGRAM (8)

A. SHORT RANGE - EARLY DEMAND
1. RETREADS
2. ADDED-ON EDUCATION (EXISTING CURRICULUM PLUS SPECIAL COURSES)
3. READY-MADES

B. MEDIUM TO LONG RANGE
1. NEW CURRICULA FOR DEVELOPING EDUCATORS
2. TRANSFER OF FUNCTIONS TO PEOPLE WITH DIFFERENT, BUT EXISTING SPECIALTIES

REQUIREMENTS FOR EDUCATORS

DECISION C

A. DEMAND:
1. NEW SPECI
2. EXISTING S
3. DISTRIBUTE
B. SUPPLY
1. FORMAL ED
TIME SERIES
2. STUDENT H
3. APPRENTIC
4. MASTERS

NS: COMPENSATORY EDUCATION

(EXPLORATORY)

***START (NORMATIVE)

TRENDS (FROM ANALYSIS OF EXPLORATORY FUTURES) (2)

FROM CONTEXTUAL MAP, ECONOMETRIC ANALYSES, SCENARIOS, ETC. TRACE THOSE TRENDS IMPLYING CHANGING EDUCATORS' ROLES. ANALYZE AND GROUP THESE ACCORDING TO THE TIME PERIOD IN WHICH THEY IMPACT

DEVELOPMENT OF NORMATIVE ALTERNATIVES (3)

A. AT SCHOOL
   1. A. MORE OF THE SAME
      B. NEW CURRICULUM-SAME TIME AT SCHOOL
      C. NEW CURRICULUM-MORE TIME AT SCHOOL
   2. SPECIAL SCHOOL: DAY OR BOARDING (MAY DEPEND ON TARGET POPULATION)
B. AT HOME
   1. SPECIAL CLOSED-CIRCUIT TV EDUCATION FORMAL AND/OR INFORMAL
   2. SUPPLEMENTARY PROGRAMMED INSTRUCTION
C. AT WORK (DEPENDING ON AGE OF TARGET GROUP)
D. NEW ARRANGEMENTS
   1. COMMUNITY CENTER
   2. EDUCATIONAL RETREATS

   OTHERS

IDENTIFICATION OF AREAS FOR SEARCH

ELECTION OF EDUCATOR ROLES (DEPENDENT VARIABLE) (5)

DIAGNOSTICIAN - RAISES QUESTION IN REGARD TO SPECIALIZATION WITHIN EDUCATION FIELD

. ABILITY
. ACHIEVEMENT
. REMEDIAL DEFICIENCIES

COUNSELOR (OR COUNSELOR-SOCIAL WORKER)

. PSYCHOMETRICIAN
. REMEDIAL TEACHERS (SPEECH, READING, ETC)
. "PURE" COUNSELOR
. COUNSELLING PROGRAM FORMULATOR
. ADVANCE PLACEMENT SPECIALIST

OMMUNITY RELATIONS REPRESENTATIVE

LASSROOM TEACHERS

. PACING SPECIALISTS
. MEDIA COORDINATORS
. DISCIPLINARIANS

URRICULUM DEVELOPERS

. LESSON PLANNERS
. INSTRUCTIONAL MEDIA SPECIALISTS (MOVIES, T.V., DRAMA-PHONE)
. GAMES (GRADED AND SPECIALIZED - ANALYZE AND "VALIDATE" MONOPOLY)

EMEDIAL SPECIALISTS (NOT ONLY FOR SUBJECT MATTER BUT ALSO "HARD CORE" PROBLEM STUDENTS)

EACHERS OF EDUCATORS

TASK ENVIRONMENT (4)

A. LIMITING THE AREA OF INQUIRY
   1. IDENTIFICATION OF STUDENTS
      A. SOCIO-ECONOMIC STRATIFICATION
      B. DEMOGRAPHIC IDENTIFICATION
      C. INTELLIGENCE
      D. ACHIEVEMENT
   2. #1, IN TURN, IMPLIES ADEQUATE "TESTS," AND DIAGNOSTICIANS FOR DETERMINATIONS OF INDIVIDUALS' RELEVANT CHARACTERISTICS
   3. HOME OR PARENTAL AND STUDENT ACCEPTANCE
   4. COMMUNITY AGREEMENT ON GOALS (THIS MAY BE TOO GENERAL; IT MAY BE AN ISSUE WITH EVERY PROGRAM. HOWEVER, SEE NORMATIVE DATA FROM MEETINGS, APPENDIX D.)

B. COSTS (PARAMETERS)
   1. ECONOMIC
   2. NON-ECONOMIC

C. BENEFITS TO SOCIETY (WELFARE PARAMETERS)

CRITERIA FOR SELECTION

DECISION ON EDUCATOR SUPPLY AND DEMAND

A. DEMAND:
   1. NEW SPECIALTIES (EDUCATIONAL TV WRITERS)
   2. EXISTING SPECIALTIES
   3. DISTRIBUTED EDUCATION (e.g. MASTER-APPRENTICE)
B. SUPPLY
   1. FORMAL EDUCATORS (BY CATEGORY) PER CAPITA-TIME SERIES EXTRAPOLATIONS
   2. STUDENT HELPERS
   3. APPRENTICES (INTERNS?)
   4. MASTERS

(6) "STUDENT" POPULATION FORECASTS

(7) DESIGN & OPERATION OF MODELS

REVISED CONCEPTS OF NORMATIVE ALTERNATIVES (3)

FIGURE 1. AN EXAMPLE OF A POLICY MAKING PROCESS

that people make that describe conditions that they feel ought to exist. During the Pilot Center operation, we used the Community Resources Panel to help us obtain "wants" for the future of education. This activity is described in our first progress report. The consensus of the panel was that the major "want," at least for the next several years, was compensatory education for the social and economically deprived peoples of our country.

Such normative data need not be left in a raw state. In Block 1 we have listed three ways in which they can be carried further. A relevance tree can be developed which consists of groups of related wants, each group being a subset of a more general group. If the relationships were actually shown graphically, a kind of pyramid, rather than a tree, would result with a few very general wants at the top, and a large number of specific programs nearer the base that help to achieve the projected end state. Once such a tree or pyramid is developed, a great many further analyses can be carried out on the refined data. These activities would help policy analysts to select those programs that would help achieve more of what ought to be. The relevance tree technique has been highly developed by the Honeywell Corporation* and it is being investigated, as described in our previous report, for use with our data.

The second way in which normative data can be treated is through "economic" analyses. Wants have a tendency to drift freely in verbal space, not related to any external events and usually not having any internal consistency. One way of avoiding this is to ask policy makers and community representatives to evaluate the marginal utility of the programs desired, let us say, to achieve compensatory education. If there are limited resources, like money, to help implement the various programs, how much value does one attach to Program A in comparison with Program B, when only 25% of A has been accomplished and 50% of B? Now suppose that Program A is further along in implementation and is 75% accomplished, and Program B is 85% accomplished, does A still have the same value relative to B or does it have less now that more of it is accomplished? Maybe both decrease in value relative to Program C which has not yet even been started. In short, it is possible to shed light on the relative strengths of wants as a function of how much they are needed in comparison with other wants and in comparision with how much has already been done. Such analyses can bring some order into what we know is a very chaotic situation when people simply express their wants. An interesting start on such an analysis is reported by Adelson, et al.**

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*Aaron L. Jestice, Long Range Corporate Planning (AM 97. Arlington, Virginia: Honeywell, Inc., September 1967)

**Marvin Adelson (ed.), "Planning Education for the Future," American Behavioral Scientist, Vol. 10, No. 7, March 1967.

A third way in which normative data may be processed is by use of the Delphi technique of Olaf Helmer*, which is a way of achieving consensus in regard to when certain predicted future states are likely to come about. An attempt by the Pilot Center to adapt this technique is described in T. B. Robertson's staff paper.

Block 2 is an alternative or parallel starting point. The Pilot Center has already developed such a start with its contextual map that leads to a set of inferences about future educator roles and the issues involved in the futures so developed. In Figure 1 we have shown that a contextual map is only one of the ways in which the center and the analysts contributing to policy making may choose to obtain inferences about trends. There are other methods, such as econometric analyses, scenarios, and so forth. Whatever method is used, the trends need to be grouped by time periods, that is, when one might reasonably expect a certain state of affairs to come into being. There would be relatively little use to consider planning for the employment of certain kinds of educators in a compensatory education program during the next five years if the analysis of trends revealed that such types probably would not be available in sufficient numbers for another ten years.

Block 3 merely indicates that subsequent analyses of the normative projections of the future can be done by the center staff independently of community interaction. In a sense, Block 3 says that raw normative data must be analyzed, by any one of the three methods already mentioned or another one that might be created, to yield alternative programs that might initially be considered feasible for implementing a valued want like compensatory education. Blocks 2 and 3 are mutually supportive, each one flagging for the other substantive areas in which either trends or wants need to be sought for corroboration of the other.

Block 4, Task Environment

Once a start has been made in identifying a set of policy objectives associated with, for example, compensatory education, the policy makers must start to narrow their inquiry in the sense of defining the area in which they care to operate. Do they want to plan for compensatory education of all people everywhere or just certain sub-groups? Do they want to continue their analyses independently of any cost considerations? of benefit considerations? If the Center continues to work with the Eight-State Project and they want to examine compensatory education, we might very well find that they are less interested in vocational education for ghetto Negroes of age fourteen to eighteen years and more interested in academic education for American Indians aged six through fourteen years. By narrowing the area of inquiry the analysts are then able to select some of the possible educator roles (Block 5) that can be considered for development to further the objectives of compensatory education.

*Olaf Helmer, Social Technology (New York: Basic Books, Inc., 1966)

Block 5, Selection of Educator Roles (Dependent Variable)

The operant terms here are "selection" and "dependent." The contextual map and other exploratory techniques can give an extensive listing of many of the educator roles that are either in existence or that are likely to emerge. Indeed, the present contextual map which the Center has developed derived fifty-eight educator roles. By taking into account the specific "task environment" that narrows the field, and knowing which societal and educational trends involving compensatory education are likely to affect certain educator roles, an analyst can then select an appropriate subset of roles for his further deliberation. The educator roles are dependent in the sense that they are inferred from the normative and exploratory futures; actually they are just at an intermediate level in a long chain of inferences that starts with the broad social trends and terminates in the specific individual behaviors that society wants to foster by planning for the future of education.

Block 6, Decision on Educator Supply and Demand

This activity is shown in a hexagon which frequently is used as a convenient code for a decision process. Once the relevant educator roles have been selected for study, it becomes a reasonable next step to ask the following question: "If we will need educators of a specified kind, will there be enough of them available to accomplish what we want for education?" In order to obtain some tentative answers to the question, an analyst might elect to look at it in terms of supply and demand. For this task he might be able to obtain some objective data. When he looks at demand he might want to partition it three ways: demand for new specialties like educational television program writers; demand for existing specialties like remedial reading instructors; or demand for specialties that might arise from trying to implement a new concept like distributed--as opposed to classroom--education that might require "master" roles in a "master-apprentice" relationship. Supply on the other hand is a question of determining what the possible sources are of people that can fill the role requirements. Just a few of these are illustrated in the figure, Block 6.

One can bring some simple decision aids to bear on the problem of supply and demand relevant to educators. Sketched below, just to show how one could start an inferential process, is a supply and demand matrix. The three columns are different levels of demand that could be obtained by extrapolations from the exploratory futures. The three rows are different lengths of time it might take to develop educators of specified types, depending upon what kinds of demands are predicted. The cell entries are merely some suggestions as to what the supply situation could be like. Of course it assumes all other things are equal to what they are now and will not change significantly--an assumption that bears independent examination.

EDUCATOR DEVELOPMENT TIME	DEMAND LEVEL: lower	DEMAND LEVEL: present	DEMAND LEVEL: higher
longer	?	?	educator shortage
present	increased standards for credentials or surplus educators	status quo	educator shortage or extended work weeks for educators
shorter	increased credential standards or educator surplus	current demand met (present shortage alleviated)	teacher aids or other methods for amplifying educator effect

It should be emphasized that this current conception of the policy-making process aims at objective discussion of policy issues in order to allow data to be used if they exist and eventually to make the results more actionable and less debatable. Of course this is always a relativistic statement since the analysis process starts with broad debate and discussion and will always result in recommendations that are going to be controversial in one respect or another. The idea, at least in part, is to provoke more informed debate both before and after analysis. The procedures involved in determination of educator supply and demand illustrate how the discussion might be made more objective. There is no real conviction at present that the subject lends itself to valid analysis in economic terms. This would have to be explored in depth by the operational center.

However, to continue with the illustration, if the process is to be made more objective, and if data are to be employed, then mathematical and logical models should be used to provide by extrapolation such data as the expected "student"* enrollment for particular time periods. Models of the same sorts can be used to predict educator supply as well; by looking at both supply and demand models an analyst can better formulate the type of decision matrix

*The term "student" is used in a very general sense so as to include people who are not in school, or in any particular organization setting, but who nevertheless are part of a conscious learning process.

illustrated in the preceding section. In addition, the exercise of the models gives the analyst more information on which to revise his thinking about possible normative alternatives. For example, after having considered all of the variables carefully, and having looked at the range of results one might reasonably expect to represent some sort of limits, an analyst might come to the conclusion that for certain kinds of educational programs it would be impossible to obtain enough teacher aides within a certain time period. This might lead him to reexamine other normative futures that have other requirements.

Block 8, Analysis of Educator Development Program

This is another step in making policy deliberations more objective but still oriented toward the futures of particular interest to the analysts. In this particular case, the area of the future of interest to our analyst is that which deals with developing educators. For purposes of illustration only, we have assumed that at least a tentative decision has been reached about an increasing educator shortage. Now, presumably, the analysts have to consider ways in which the requirements for more educators might be met. Bear in mind that this area has already been defined and limited by processes back in Block 4, Task Environment. At the present, then, we are talking about the need to develop educators, or educators to fill new roles, for certain groups of students and with certain constraints established by considering cost and benefit limits.

A first step in this particular analysis might be to match the intentions of the analysts to the requirements of the postulated future. Specifically, need the educators be supplied relatively soon or relatively far off? Is the demand short-range or long-range? What is the charter of the group that the policy analysts represent? Are they a long-range planning group? And so forth. In the flow diagram we have shown some of the alternatives for developing educators, arranged by time.

Block 9, Development of Decision-Aiding Data

So far in the policy-making process the objective has been to refine the arguments and to focus on whatever data are available. In this present step, the emphasis is on looking at alternatives to the various sets of data so far presented in the analysis process. Shown in Block 9 are two steps that might be taken to clarify some alternatives. First, the analysts can look at various educator development programs in terms of lead times, that is the amount of time that elapses between the start of implementation of a program to develop educators and the time when new educators would be made available as a result of the program. From such an analysis one would expect programs to be grouped by lead times so that analysts can make some recommendations about the appropriateness of a program in comparison with the predictions of emerging needs. Second, and in part this will already have been done as part of the modeling

process, families of supply and demand curves will be looked at (or generated) for the particular sets of time periods that correspond to the program lead times developed. In other words, based upon alternative program lead times, one can go back to the supply and demand curves to make sure that they will hold for the particular spans being considered. It is quite possible that new input data will have to be given the model, or that longer extrapolations will have to be made, or that finer interpolations will be necessary.

Block 10, Analysis of Potential Programs

Once potential alternative programs have been studied from the point of view of suitability based upon lead time, they ought next to be analyzed in terms of what is needed for their accomplishment. This is referred to, running the risk of borrowing a term from another field, as determining the "Pareto-optimum" point, that is, the point at which one program can no longer be implemented without taking away resources from another. What are the resources that are likely to be scarce for any particular program? In some cases it will be money but in others, for example, it will be people with certain skills who cannot be developed in a shorter period of time regardless of how much money is spent. The next point, since we assume that there is going to continue to be competition for scarce resources in our national economy, is one of determining how to make tradeoffs among desirable programs. This may well be beyond the domain of the particular policy analysts with whom we have been concerned so far. In any event, the incremental marginal utility of a program means that it is worth relatively less and less as more and more of it is accomplished in comparison with other valued programs that are comparatively less far along in implementation.

Blocks 11 and 12, Auxiliary Normative Forecast and Task Environment

At this point in trying to trace out a policy-making process, we choose to introduce a discontinuity. So far in the discussion, the assumption has been that the future being looked at is more or less amenable to analyses such as are being described. Lest we be lulled by such straightforward rationalism, it is good to remember that ours is not a simple world. There are a large number of normative projections that operate simultaneously. One is introduced here as such a reminder. Keppel* points out that a revolution in educational quality should succeed the revolution in quantity of education. The implications of his normative projection are as broad as they are varied. Like any other such statement of intent or desire, it must be refined and limited in order to be relevant within a specific policy context. In the present case we could say that the statement implies, among a vast number of other things, changes in the credentialing requirements for educators and the

*Francis Keppel, The Necessary Revolution in American Education (New York: Harper & Row, 1966), p.1.

development of better curricula. Granted that this is only an example, it nevertheless points up the emergence of a conflict, or at least a worsening of an existing problem. If there already is a shortage of educators that is going to continue to grow as a result both of generally increasing demand and demand created by new programs, is not this shortage going to get still worse if we insist upon educators with higher qualifications, or as we divert people from teaching to curriculum development?

Block 13, Balance Development Programs

Analysis has revealed that there is a need to develop certain kinds of educators within certain corresponding time periods. Furthermore, we have discovered that the demand for educators is probably going to be greater than the first analysis revealed. The pros and cons of contemplated educator development programs will have to be explicated in terms of their various relative utilities. Also, for example, they might have to be evaluated in regard to their legal implications. During our first Community Resources Panel meeting, as reported in our previous progress report, Harold Horowitz suggested that the court ruling of Judge Skelley Wright in regard to some aspects of multi-track education would have significant consequences for compensatory education. In what ways this would impact on educator development programs can only be a matter for speculation at this time. It is possible, for example, that equality of educators would have to be demonstrated. It is also possible that testing as a basis for selecting students for compensatory programs would have to be abandoned. In any event, educator development programs would have to be carefully balanced against the known and projected factors that might affect them.

Block 14, Policy Alternatives

As a result of all of the previous deliberations, policy alternatives would be formulated. Since the future cannot be known, policy recommendations would have to take the form of listings of various alternatives and the reasons why each was formulated. In short, each possible policy or program would be accompanied by a synoptic description of the foregoing processes specific to each case.

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The policy-making proces does not terminate at this point. First, it must be recognized that the analyses described above are part of a recursive process, one that returns through the same analytic loop a number of times but each time starts with the variables it had ended up with the previous time, thereby zeroing in, hopefully, on some well-refined and thoroughly thought out proposals. Second, it is the hope of this Center that further discussion and planning assistance would be provided by the Center staff in the home deliberations of the policy makers. Thirdly, the Center would continually be trying to evaluate and, consequently, modify its own policy assistance activities by obtaining systematic feedback from the people who participated in the experience.

A BRIEF COMMENT ON EDUCATIONAL POLICY*

by

Harry F. Silberman

SDC Consulting Panel

*Expansion of remarks made at a seminar of the Policy Research Center at SDC, July 13, 1967.

29 February 1968

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There is considerable discussion today about who should decide educational policy. Education has always been used in this country as a means of assimilating into our culture immigrants from other countries. The schools have served as an efficient tool by which the dominant middle class power structure in our society inculcated its values in children from all parts of our society including the most recent immigrants. Members of lower socioeconomic groups in the central city are also being exposed to this process today. There is a difference in the reaction of the current minority movement to this process, however, in that they are demanding a role in the policy making function in education. There is a desire not to be dominated by the middle class power structure. They desire to participate in deciding what children should be learning in school. There is a genuine struggle here between two value systems. The question is whether to use the public school as a melting pot to inculcate middle class values or rather to make room for a different set of values within public education.

A related issue that is being discussed is the determination of who shall do the educating. Some critics attribute the failure of public education to meet the needs of children of the poor to public operation of the schools. It is suggested that schools should be subject to the same principles of free enterprise that characterize our other institutions. Christopher Jencks has recommended that an allotment be provided to parents for their children's education. Presumably, parents would shop freely on an open competitive market for schools of their own choice. In open competition, the better schools would grow and flourish and the less effective schools would not survive. Other critics advocate greater centralization in education. The principle of local autonomy is considered outmoded because of the broader perspective and greater resources that are available at regional or federal levels. Certainly, the trend in recent years has been in the direction of increased participation by the federal government in educational decision making.

Another issue is how education should be practiced. Questions of how education should be implemented are inevitably associated with discussions of educational policy. Indeed, educational policy is inherent in the means of its attainment. Education policy and practice cannot be separated meaningfully. Recently, the courts in Washington, D.C., interpreted educational policy by rejecting both student grouping procedures and testing practices that were currently being used in the D.C. schools. The policy question here is whether the schools should educate to increase variability or to reduce variability. The schools are doing a pretty good job of increasing variability among children now, but spokesmen for the lower socioeconomic groups in our society are struggling to reduce that variability. It is not enough to provide equality of educational opportunity to children from lower and middle class neighborhoods. That practice maintains the present gap between these two groups. Genuine school integration would have the effect of closing the gap by giving superior education to the central city areas or bussing for the purpose of using middle class children to educate lower class children. The

study on equality of educational opportunity by James Coleman revealed the importance of the peer group as an influencing factor in the education of children. If you want your child to have a better education it doesn't matter what the quality of the school is so long as your child associates in school with bright, highly stimulated children. People from middle class neighborhoods, on the other hand, do not want their children held back. They have no particular interest in closing a gap which is currently in their favor. Group tracking, neighborhood schools, and current use of standardized tests, tend to maintain the gap while the concept of integration tends to reduce that gap. Until the policy question concerning whether or not the gap shall be closed can be settled, no resolution can be expected on questions of educational practices that merely reflect an unresolved conflict in educational policy. Much of the current discussion about educational problems reflects a real power struggle which we have not yet fully accepted.

Another issue which has received considerable attention lately is the question of how education is to be financed. Here again there is evidence of a conflict over the policy question of whether or not to close the educational gap among advantaged and disadvantaged groups. Certainly people who decide educational policy are going to be interested in supporting the public schools. But people who don't play a role in forming educational policy, particularly if that policy goes against their wishes, will not support the public schools at voting time. It might be predicted that any serious attempt at closing the gap would cause large numbers of people from the middle class suburbs to withdraw from public education and move to a private form of schooling to maintain their advantage. They will be increasingly resistant to supporting a public school system that is dedicated to a concept of unequal educational opportunity designed to take real steps toward closing the educational gap between their children and those of the culturally deprived.

Each of the educational issues mentioned above are strongly influenced by the outcome of the current power struggle among divergent elements in American society. Educational policy will ultimately be determined as an outcome of the current struggle. It seems only proper that any group concerned with long-term educational planning be especially interested in predicting alternative outcomes of this struggle. Contingency plans might then be made for various alternative predicted outcomes.

I suspect that under any probable outcome in the present domestic crisis, we will continue to use the public schools as a Venturi tube for shaping an integrated society. Public education has always been used to establish a set of common values for the essential purpose of maintaining a cohesive society.

Of the many educational values or goals that have been commonly held in the history of education, three seem particularly appropriate for the future. The first goal is to enhance man's acceptance of change. The accelerating rate of change in society seems to be one of the few predictable characteristics

of the world today. It is becoming increasingly important to teach children how to learn, to develop the desire for change, to be flexible in a constantly changing world. A second major objective for the future should be the achievement of the humanistic ideal. We must be concerned with developing a sensitivity in children to the needs of others; not only others with whom they play, but others on opposite sides of the earth. Children must be taught to identify with the problems that other human beings are having everywhere. A third important educational goal is the establishment of esthetic values in children. The rapid growth in modern technology promises to obsolete the work ethic that our forefathers were so careful to instill. One of the important future problems may be that of preparing people to accept leisure without guilt. People must be prepared to make effective use of leisure.

In addition to the above-mentioned conservative goals designed to facilitate adjustment to existing society, the public schools should also serve as a vehicle for effecting changes in that society. The rapid growth of a science of education makes it possible to effect changes in behavior that will allow the schools for the first time in history to be an implement of change in society rather than merely reacting to such changes. This is not a new concept. In a book entitled, "Dare the School Build a New Social Order," published in 1932, George Counts criticized the progressive education movement, of which he himself was a leader, for its failure to develop a theory of social welfare. During the new deal, Counts called progressives away from a child centered aim of education and asked them to use education to build a new social order dedicated to collectivism rather than laissez-faire individualism. Although progressives did not share Counts' collectivism, they were persuaded that the times did demand a predominance of social aims in education. Even if the Counts proposal had been accepted, the technology was not available at that time to implement the proposal. But the growing science and technology of education is making it increasingly possible today for education to be used to influence the direction of social events.

It is interesting to speculate about what schools should look like in order to implement such bold objectives in the future. My view of the school in the future is something as follows: First, school will begin at birth and will end at death. It will not be an isolated activity held between the hours of 9:00 a.m. and 3:00 p.m., between the ages of 6 and 22. We will start educating children when they are born, if not sooner. A well established science and technology of education will be used from the very beginning. Drugs may be used in this process as may eugenic means. Genetic surgery may also be a part of the educator's resources. Presently we treat education, recreation, and vocation, as separate segments of one's life. In the future, the occupational segment, the recreational segment, and education segments, will be merged into one. This has always been an artificial separation and has resulted in each of the segments being less effective than was possible if they had been integrated.

As the state-of-the-art in educational technology advances, it will become increasingly likely that this technology will be used to engineer human behavior in the direction of national objectives. This may not be desirable in a democracy, but we should recognize that it may take place. This shift toward using the latent potential of public education to solve social problems will probably not come about by means of administrative solutions alone. For example, proposals to add new equipment, to raise teachers' salaries, to let industry be responsible for education, etc., might be thoroughly reasonable suggestions, but they beg the training questions by leaving completely unanswered the difficult costly and unglamorous operational questions of recruitment, content, structure and sequence of training at the molecular level. Moreover, they make it more difficult to derive operational solutions to educational questions by implying that the global administrative arrangements have solved all of the operational problems. These trends are more likely to be achieved through less dramatic means, i.e., long-term support for the development of effective instructional products and procedures that do not have spectacular dramatic effects but merely make subsequent learning progressively more efficient.

A LAWYER'S VIEW*

by

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APPENDIX I

*Expansion of remarks made at a seminar of the Policy Research Center at SDC, July 13, 1967.

The Office of Education's report, Equality of Educational Opportunity (the "Coleman Report"), and the Civil Rights Commission's report, Racial Isolation in the Public Schools, have, to say the least, fundamental implications for the formulation of educational policy in the United States. Aside from their impact on legislative and administrative policy makers, and the electorate which selects those policy makers, these reports have a separate significance for the law. They provide data essential to the resolution of current issues of the constitutional doctrine which makes up the legal matrix within which educational policy making takes place. Further, they suggest new issues of equal import on which future programs and studies must be undertaken. The case studies in Desegregation and Education are illustrative: a number of cities have seen threatened and actual law suits to bring about elimination of de facto racial segregation in the public schools, and school administrators are concerned at the lack of sufficiently clear legal doctrine. Recently, in Hobson v. Hansen,[1] a case dealing with the District of Columbia public schools, Judge J. Skelly Wright made use of some of the data in the reports by ordering the school board to take various steps to deal with inequalities in educational opportunity.

It will be useful, first, to summarize the relevant data in the reports and highlight the data that are not there.

The starting point is that the "average (racial or ethnic) minority pupil scores distinctly lower on ... (achievement) tests at every level than the average white pupil."[2] To the extent that schools and school environments are factors in individual students' achievement levels, disadvantaged children--low socio-economic status, and, particularly, Negro--are affected most by what the schools offer. More specifically, the composition of the student body--percentage higher socio-economic status and percentage white--and, to a lesser extent, the quality of teachers, are related to achievement of individual students, and this relationship is most meaningful with respect to educationally disadvantaged children. These in-school factors account, however, for less than the total explanation of the variations in achievement between, for example, Negro and white children; to state this point in another way, educationally disadvantaged students will not be enabled to achieve at their grade levels solely by changing the composition of the student bodies in their schools and the quality of their teachers.

There is an important gap in the legally significant data in these reports--a gap which exists because public school education in the United States has yet to rise to its greatest current challenge. The findings in the Coleman Report are based on a standard pattern of public school education as it exists today --i.e., there are not in these data any separable results based on special programs for disadvantaged children--e.g., drastically reduced class sizes, supportive health and welfare personnel, programmed learning, and the like. The Civil Rights Commission's report does assess "compensatory education" programs, i.e., programs to increase the quality of ghetto schools, and

concludes that such programs "on the present scale are unlikely to improve significantly the achievement of Negro students isolated by race and social class."[3] The words "present scale" are critical here, for the Commission does refer to increases in achievement under a high-cost experimental compensatory education program in New York which preceded Higher Horizons. Gains in achievement diminished under the lower-cost Higher Horizons. The Commission's report does not include a description of the current, expensive, More Effective Schools program in New York, in which, it has been reported, minority students are achieving at grade level. The Commission states its confidence that massive upgrading of the quality of education offered in ghetto schools cannot but help to increase achievement, but cautions that it is speculative whether the effects of racial and social class isolation on achievement could be overcome. There is need for much more social science data -- for educational policy making and the development of pertinent legal doctrine -- about educational programs through which schools can enable educationally disadvantaged students to achieve at or closer to their grade levels.

The Commission's report analyzes in detail the factors in metropolitan areas and in central cities which lead to racial imbalance in schools. The metropolitan area problem is summed up in the statement that the 212 metropolitan areas in the nation are served by 6,604 school districts.[4] This is the governmental structure, with its attendant disparities in governmental resources available for spending for education, which is the background to the flight to the suburbs by those who flee for educational reasons. In the central cities it is school board actions -- in selecting school sites, defining attendance areas, setting transfer policies, and the like -- which contribute to racial imbalance in the schools. And in both metropolitan area and central city there are, overriding, racial patterns in housing, which determine the make-up of student bodies in school districts and attendance areas within districts.

Why are these findings, and the need for others, relating to compensatory education, legally significant? In an excellent "Legal Appendix," which concludes that school boards should be found to have a constitutional duty to eliminate de facto school segregation, the Commission's report relies, as did Judge Wright in Hobson v. Hansen, on one of the findings: a de facto segregated school offers an unequal educational opportunity to the Negro child, and the Negro child achieves closer to his grade level in an integrated classroom. These studies provide the factual basis for the argument that children in racially and socioeconomically isolated schools are severely harmed by that educational environment. The legal issue is the constitutional significance of these facts.

The Commission's legal memorandum suggests that the injury to Negro children is so grave that the equal protection clause should be found to require undoing all racial imbalance in public schools, whatever the competing considerations may be -- i.e., there can be no constitutionally permissible rational basis or justification for a school board's permitting the

continuation of racially isolated schools. The analogy is to, among other cases, Reynolds v. Sims[5] and Harper v. Virginia State Board of Elections;[6] the justifications there, for geographical apportionment of the upper house of a state legislature and for a poll tax, were insufficient to outweigh the harm done to "one man's" vote. Judge Wright, as have a few judges before him, finds the injury inherent in racially imbalanced public schools to be constitutionally significant, and orders remedial measures in Hobson. But he does not require undoing racial imbalance at all costs; he orders bussing of Negro students from overcrowded to underutilized schools, after considering the reasons advanced for not doing so and finding them insufficient to outweigh the injury done the students in the overcrowded school. "For at least this one alternative ... the resulting social gains far exceed the costs of any and every kind," so that "adherence to the neighborhood policy is beyond justification ..."[7] and he orders the school board to formulate an integration plan "which carefully assesses the virtues and costs of the spectrum of integration strategies"[8] which might at least be considered in the context of Washington, D. C.'s population distribution. Presumably if the costs are great enough the school board will not be required to adopt measures which would have the virtues of lessening racial imbalance. Judge Wright's standard goes no farther than that of the other courts which have found constitutional violations in maintenance of de facto segregated schools -- the school board must take whatever steps are "reasonably feasible" to eliminate the racial imbalance.[9] The analogy here is not to Reynolds and Harper but, staying within the realm of voting cases, to Carrington v. Rash,[10] in which the Court said that Texas could have residence tests for voting, but it could not, relying on a presumption that many servicemen in Texas do not intend to stay there when military compulsion has been lifted (and for reasons of administrative feasibility), deny the vote to all servicemen who came to Texas in uniform. Texas was required to adopt a reasonably feasible means -- inquiry into each serviceman's intentions as to residence -- of administering its registration processes which would lessen the injury its system would otherwise inflict on some servicemen.

The data in the Coleman and Civil Rights Commission reports support the less expansive constitutional duty. As mentioned previously, make-up of the student body and the other factors isolated in the two reports do not account for anywhere near the total variances in achievement of children. Courts can understandably and soundly leave to school boards the weighing of the costs and virtues of varying aspects of school administration, within constitutional limits such as those articulated by Judge Wright, when the one factor attacked, maintenance of neighborhood schools in the face of racially imbalanced student bodies, accounts for just some portion of lower school achievement. The data these reports do not contain are relevant here, too. If compensatory education programs can significantly increase achievement, effectuation of these programs may require dealing with students in a way that would not be possible while at the same time integrating classrooms. Again, some scope for the school board's weighing the virtues and the costs may be the better solution here, rather than isolating racial imbalance for mandatory school board action regardless of the possible compensatory education justification for adhering to neighborhood schools.

Judge Wright has significant words in this regard, which have tended to be overlooked in some of the discussion about his opinion in Hobson: "where", he said, "because of the density of residential segregation or for other reasons children in certain areas, particularly the slums, are denied the benefits of an integrated education, the court will require that the plan include compensatory education sufficient at least to overcome the detriment of segregation..."[11] Experience with, and data from, innovative and expensive compensatory education programs will have an importance beyond the de facto racial segregation problem. To the extent that compensatory education programs can bring educationally disadvantaged children, particularly in central city schools, closer to achieving at grade level the same constitutional principle arguably applies: the schools must take whatever steps are reasonably feasible -- must make a constitutionally permissible assessment of the virtues and the costs of various compensatory education strategies, as well as integration strategies, as they might be carried out in specific districts -- to provide a more equal educational opportunity to such children. Certainly there is no more important educational policy issue today than that of finding means to provide opportunity for all children to achieve to the fullest extent of their capacities. Advances in constitutional doctrine can be expected to follow closely upon the demonstration of "reasonably feasible" means of enabling educationally disadvantaged children to achieve at or closer to their grade levels.

The Commission's report examines the reasons why racially isolated schools occur in metropolitan areas, and its description of the patchwork, or crazy-quilt, of school district boundaries suggests the inclusion here of a comment on the constitutional significance of such local governmental organization. The Commission's emphasis is on racial isolation, but its point is applicable as well to other aspects of equality of educational opportunity. Just as the reasons for the neighborhood school may not justify some inequalities in educational opportunity, so the reasons for the local school district may not justify some district-to-district inequalities in educational opportunity. The Commission's report examines this question, as the basis for its conclusion that Congress is empowered under the fourteenth amendment to deal with such inequalities. It has been held that state law could not permit one locality in the state to close its public schools while schools were still operating in the rest of the state,[12] and that principle may well be applicable with respect to inequalities in educational opportunity from district to district within a state. The time has come, it seems, for declaration by the courts that states (and their subdivision, school districts) are required by the fourteenth amendment to adopt "reasonably feasible" means of dealing with interdistrict racial imbalance and other inequalities in educational opportunity. At the very least, there is to be decided, in Judge Wright's terms, the question whether the resulting social gains from requiring such interdistrict action in a state would "far exceed" the costs of doing so. Today, perhaps, adherence to individual school districts, for some purposes at least, is beyond justification.

The Coleman and Civil Rights Commission reports are good examples of attempted answers by social scientists to some questions asked by, among others, lawyers. The current constitutional issue raised by de facto segregation need not be finally decided now without access to pertinent social science data. A lawyer's view of these reports makes clear the necessity that lawyers, anticipating tomorrow's legal issues, do their part in asking the questions which other social scientists seek to answer.

Footnotes

1 000 F. Supp. 000 (D. D.C. 1967).

2 Coleman Report, at 21.

3 At 205.

4 Id., at 17 n.1.

5 377 U.S. 533 (1964).

6 383 U.S. 663 (1966).

7 000 F. Supp. at 000.

8 Id., at 000.

9 See, e.g., Jackson v. Pasadena City School Dist., 59 Cal. 2d 876, 382, P.2d 878, 31 Cal. Rptr. 606 (1963).

10 380 U.S. 89 (1965).

11 000 F. Supp. at 000.

12 Hall v. St. Helena Parish School Bd., 197 F. Supp. 649 (E.D. La. 1961), aff'd, 368 U.S. 515 (1962). See, also, Griffin v. County School Bd., 377 U.S. 218 (1964).