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ABSTRACT

This report has three objectives: (1) to identify social indicators relating to policy concerns of the legislature, state board of education, and commissioner of education; (2) to predict the future status of selected social indicators, using the assumption that present policies will be continued; and (3) to recommend policy changes for achieving more desirable futures in selected areas. Section 2 of the report presents the social indicators that were identified and the criteria that were used in their selection. Section 3 presents the forecasting model developed while section 4 includes a description of the procedure used in identifying the variables affecting the indicators used in the model. Section 5 contains forecasts of the future status of selected social indicators and a description of the cross-impact analysis methodology used in making the forecasts. Section 6 includes listing of the issues that might have an impact on education and the alternative policy decisions that were proposed to meet changes created by these issues. Section 7 contains recommendations regarding alternative policy decisions along with some recommendations regarding goals of education in Florida and the process of formulating educational policy. (Author/IRT)

FORECASTS OF SELECTED SOCIAL INDICATORS OF EDUCATIONAL OUTCOMES AND RECOMMENDED POLICY CHANGES

Department of Education Project on
Social Indicators -- Contract R5-175

(Final Report)

Prepared by Andres Collazo, Arthur Lewis and Ward Thomas

University of Florida

June 26, 1976

Preface

This is the fourth and final report issued in conjunction with Board of Regents Contract No. R5-175 "Social Indicators for Educational Planning -- The Skills and Knowledge of Florida Citizens." The previous reports were:

"A Framework for Selecting and Utilizing Educational Indicators for Florida Citizens" - November 1, 1975

"Social Indicators for Assessing Educational Achievement of Florida Citizens" - December 19, 1975

"Components of a Model for Forecasting Future Status of Selected Social Indicators" - March 26, 1976

Selected information from these earlier reports will be used in this final report.

The assistance of a number of individuals was essential to the completion of this study. Personnel in the Strategy Planning and Management Information System section in the office of the Associate Deputy Commissioner of the State Department of Education provided excellent support. They provided or helped us to secure needed technical assistance. They made the services of Dr. Jay Mendell, futurist from Florida Atlantic University, available to us. Perhaps their greatest contribution was their openness to new ideas and their willingness to let the investigators explore new approaches to old questions.

The following reactor panel assisted in the identification of social indicators: Dr. Jacob Beard, Dave Ehlert, Dr. Helen Franke, Dr. James Longstreth, Dr. Andrew Robinson, Fred Schultz, Dr. Crane Walker. The reactor panel provided valuable assistance by critiquing a preliminary

list of indicators. Three different groups of educators and laymen offered suggestions which were used in revising the list.

A faculty panel provided assistance by preparing reports of new developments in their fields of interest based on attendance at national conferences. The members assisted in the identification of variables associated with educational achievement. A list of the issues facing education was developed by the panel as well as alternative solutions to these issues. They assisted in forecasting future values of social indicators. They also assisted in the formulation of policy recommendations. The investigator is indebted to the following faculty members at the University of Florida for their assistance on the panel:

Dr. W. Alexander - Instructional Leadership and Support Department
Dr. W. Drummond - Instructional Leadership and Support Department
Dr. R. Henderson - Sociology Department
Dr. V. Hines - Foundations in Education Department
Dr. S. Johnson - General Teacher Education Department
Dr. S. Kimball - Anthropology Department
Dr. R. Kimbrough - Administration and Supervision Department
Dr. R. Scher - Political Science Department
Dr. B. Sharp - Dean, College of Education
Dr. R. Soar - Foundations in Education Department
Dr. R. Stripling - Counselor Education Department

The investigator is particularly indebted to Andres Collazo and Ward Thomas, two doctoral students who worked as Research Assistants on this study. Each of them brought particular skills and knowledge that were indispensable to the completion of the study. Further, each developed an intense interest in the study itself. As a result, the study became a team effort and the following report is the team's report.

Arthur J. Lewis
Principal Investigator

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SECTION I

Overview

This is the report of a study undertaken with a grant from the Board of Regents of the Florida State University System and the Office of the Deputy Commissioner for Educational Management, Department of Education. The study had three objectives: (1) "To identify social indicators relating to policy concerns of the Legislature, State Board of Education, and the Commissioner of Education," (2) "To predict the future status of selected social indicators, using the assumption that present policies will be continued" and (3) "To recommend policy changes for achieving more desirable futures in selected areas." (Contract R5-175). This report contains information regarding each of these objectives. As a result of this study, some ideas have emerged regarding procedures that could be used in the formulation of educational policy in the State of Florida. Accordingly, this report will include some recommendations regarding procedures for policy formulation.

The social indicators that were identified as a part of this study are included in Section II of this report. The criteria that were used are described and a list of the social indicators selected is summarized in tabular form.

In order to predict the future status of selected social indicators, it was necessary to develop a forecasting model. This model is described in Section III of the report. An important component of the model is a list of variables affecting social indicators. Section IV includes a description of the procedures used in identifying these variables and a list of the variables used in the study.

Section V of the report contains forecasts of the future status of selected social indicators, using the assumption that present policies will be continued. A description of the cross-impact analysis methodology used in making these forecasts is included and a number of forecasts based on different initial assumptions are presented.

In order to recommend policy changes for achieving more desirable futures, selected issues that might have an impact on education were identified. Alternative policy decisions regarding these issues were proposed and, through the use of the cross-impact analysis, the effect of these alternatives on selected social indicators was forecast. These forecasts served as the basis for making policy recommendations. Section VI of the report includes a listing of the issues identified and the alternative policy decisions. The forecasts of consequences of using various alternatives are also included in Section VI.

Section VII includes recommendations regarding alternative policy decisions based on data reported in Section VI. Some serendipitous recommendations regarding goals of education in Florida and the process of formulating educational policy are also included in this final section.

SECTION II

Social Indicators of Educational Outcomes

Rationale for the selection of social indicators

The first step in this project was to identify and select social indicators to be used in the assessment of educational outcomes in Florida. For the purpose of this project, a social indicator was defined as a quantitative or qualitative statement that provides information regarding the status of Florida citizens in relation to one or more of the goals set forth in the Education Policy for the State of Florida (Department of Education, 1975).

The use of social indicators as a means of measuring social conditions and trends has increased during the past decade. In a review of the state of the art of social reporting and the use of social indicators, Plessas, and Rieca (1972) described the field as underdeveloped with few measures of social welfare and progress, and with no unified body of theory. Nevertheless, they pointed out three potential gains from the use of social indicators: (1) the use of social indicators can result in an improvement in the quality of descriptive reporting; (2) analytic studies of social change can lead beyond describing a particular trend to identifying its precursors and suggesting causal variables whenever possible; and (3) indicators are our sole possibility for developing an ability to predict the future.

The use of social indicators as a part of a statewide strategy for planning and policy-making should aid decision-makers in the allocation of resources to education and in the design and modification of educational programs. Further, by improving the quality of descriptive reporting,

social indicators will enhance the ability to forecast the impacts of future contingencies on educational outcomes.

Four assumptions provided guidelines for the selection of social indicators. These assumptions deal with the purpose of education, goals of education, locus of education and target population for education.

1. Purpose of education - The Florida Constitution specifies that the state shall provide education programs "that the needs of the people may require." (Department of Education, 1975, p. 1) Social indicators, therefore, were selected to provide information regarding the extent to which education is fulfilling its role in meeting the needs of the people.

2. Goals of education - The goals of education for the State of Florida are set forth under the following headings: basic skills, general education, vocational competencies, advanced knowledge and skills, research and development, recreation and leisure skills. (Department of Education, 1975) These goals defined the areas in which social indicators were selected.

3. Locus of education - A Department of Education publication indicates that education takes place in a number of settings: the home, the community, the church, and other institutions, as well as schools. (Department of Education, 1975) Accordingly, social indicators that were selected reflect what has been achieved through a combination of influences.

4. Target population for education - In Education Policy for the State of Florida, public education is charged with the responsibility for providing learning opportunities for persons of all ages from early childhood to late adulthood. (Department of Education, 1975) Therefore, the social indicators that were selected provide information on the level of competence of citizens of all ages.

Three primary types of measures were considered as a basis for social indicators: (1) measures of the level of knowledge and skills; (2) measures of the ability to apply knowledge and skills; (3) measures of the utilization of knowledge and skills. When appropriate, measures associated with attitudes toward education were considered. The first two types of measures are relatively direct indicators of performance and are familiar to educators. These measures are referred to in this report as performance measures; for example, results on the Florida Eighth Grade Test. The use of measures of

conditions in society as a means of assessing the utilization of knowledge and skills is a new idea that has not been tried in practice. These measures are relatively indirect and are referred to in this report as utilization measures. An illustration of a utilization measure would be the percentage of the labor force that is unskilled. The difficulties and limitations associated with the selection and use of social indicators are discussed in the second technical report of this project. (Collazo, Lewis and Thomas, 1975)

Social indicators recommended

The seven goals listed in the Education Policy for the State of Florida (Department of Education, 1975) served as a basis for categorizing social indicators. The goals as stated were too general to be used in selecting outcome measures. Accordingly, it was necessary to describe how an individual would perform if he or she had achieved the goal. The procedure followed in elaborating these performance descriptions, together with the descriptions, is to be found in the second technical report of this project. (Collazo, Lewis and Thomas, 1975) Once the seven goals were defined in operational terms, it was possible to select measures of performance and attitudes. The first step was to consider the possible use of existing statewide programs for collecting data to measure educational outcomes. Later, additional performance and attitude measures were examined as possible sources of data.

After reviewing the literature on published tests and the statewide testing program, it was decided to recommend criterion-referenced measures rather than norm-referenced measures. The former would indicate the percentage of individuals who have met a given level of competence in terms of certain objectives. On the other hand, norm-referenced measures would indicate only the positions of individuals in relation to the performance

of others (norm group) on the same measure. Furthermore, these measures have their norms changed periodically, thus obviating their use as time series data. Criterion referenced measures, on the other hand, could provide adequate time series data regarding the level of achievement of Florida citizens and consequently would provide better information for making policy decisions.

A variety of sources were consulted to identify appropriate utilization measures. Some social indicators were selected from an assessment of educational needs conducted in Florida. (Department of Education, 1970) Others were selected from various published sources of social indicators. A panel of experts was asked to react to a proposed list of social indicators and to suggest others. (See p. ii for list of members of reactor panel)

A large number of possible social indicators were identified in this process. The list was reduced to its present length by using the following criteria:

1. The quality and appropriateness of the data-collecting procedure
2. The ease of collecting the information
3. The cost of collecting the information
4. The probability of public acceptance of the significance of the social indicator
5. The importance of the goal associated with the social indicator.

The social indicators recommended for use are listed in Tables 1 and 2. Table 1 includes performance measures and attitude measures. Some of the cells in this table are empty because no suitable indicator was identified. Table 2 includes utilization measures and indicates the source of the data.

Table 1

Recommended Performance Measures and Attitude Measures

Goals of Education		Performance Measures	Attitude Measures
Basic Skills		National Assessment of Educational Progress tests (NAEP) in reading, writing and mathematics OR State Assessment Program and Adult Proficiency Level (APL) tests	
General Education	Human Relations	NAEP	NAEP
	Citizenship	NAEP	NAEP
	Moral and Ethical Conduct		
	Mental and Physical Health		
	Aesthetic Scientific and Cultural	NAEP (science, literature, social studies, music and art areas)	NAEP
	Environmental and Economic Understanding	NAEP (economic understanding only)	
Vocational Competencies		NAEP AND General Aptitude Test Battery (GATB)	NAEP
Professional Competencies		Number passing professional licensing examinations. Passing rate on professional exams of individuals educated in Florida	
Advanced Knowledge and Skills		Tests that are administered to those who are intending to continue graduate studies: GRE, LSAT, MCAT, DAT	
Research and Development			
Recreation and Leisure Skills			

Table 2

Recommended Utilization Measures

Goals of Education	Utilization Measures	Data Sources
Basic Skills	Number of illiterates per 100,000 people	U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the U.S. (S.A.U.S.)
	Percentage of population enrolled in school by age and place of residence	S.A.U.S.
	Percentage of selective service draftees and volunteers failing pre-induction and induction mental tests	S.A.U.S.
	Percentage of population completing selected school grades	U.S. Department of Commerce, Bureau of Census, General, Social and Economic Characteristics, PC (1) - C 11 Florida (GSEC)
	Non promotion in Florida Public Schools by grade level	Research Reports of Florida Department of Education (RRDOE)
	Number of newspaper subscriptions in Florida/capita	Standard Rate and Data Service
Human Relations	Number of divorces/1000 population	Florida Statistical Abstract (FSA)
	Rate of divorces in relation to marriages	FSA
	Referrals to juvenile courts by parents or guardians/1000 population	Department of Health and Rehabilitative Services, Division of Youth Services, Florida Juvenile Court Statistics (FJCS)
	Relationship between victim and offender for certain violent crimes	Executive office of the President: Office of Management and Budget, Social Indicators, 1973

Table 2 (cont.)

Recommended Utilization Measures

Goals of Education	Utilization Measures	Data Sources
Citizenship	Percentage of persons of voting age registered to vote	State of Florida, Office of the Secretary of State (OSS)
	Percentage of registered voters who cast ballots in selected elections	FSA
	Percentage of persons in political parties	FSA
Moral and Ethical Conduct	Crime rates by type of crime	FSA
	Percentage of 10-17 years old referred to juvenile courts	FSA
	Percentage increase-decrease in juvenile delinquency referrals by sex and race	FJCS
	Illegitimate births as a percent of live births	Department of Health and Rehabilitative Services, Division of Health, Florida Vital Statistics (FVS)
	Number of cases of fraud brought before courts in the state	FSA
	Number of persons in correctional institutions/1000 population	FSA
Mental and Physical Health	Number of infant deaths/1000 live births	FSA
	Number of patients in mental hospitals/ 1000 population	FSA
	Number of persons in nursing and personal care homes/1000 population	FSA
	Days absent from work on account of alcoholism	Department of Health and Rehabilitative Services, Bureau of Alcoholic Rehabilitation

Table 2 (cont.)

Recommended Utilization Measures

Goals of Education	Utilization Measures	Data Sources
Mental and Physical Health (cont.)	Rate of venereal disease	PHS
	Incidence of drug use and abuse by age, sex and race	State of Florida, Department of Law Enforcement
	Rate of admissions to State Mental Hospitals	ESA
Aesthetic, Scientific and Cultural Knowledge	Contributors to education television/ 1000 population	Public Broadcast Service Stations
	Per capita support of public television	Public Broadcast Stations
	Per capita support of music and art	Florida Department of State Division of Cultural Affairs (DCA)
	Number of publicly supported orchestras, theater companies, dance companies, etc.	DCA
Environmental and Economic Understanding	Number of local chapters of environmental groups and number of members in such groups	Organizations
	Rank held by environmental concerns in opinion surveys of the importance of public issues	Louis Harris Poll
	Number of business failures per year	U. S. Department of Commerce
	Number of children receiving Aid to Dependent Children	Department of Health and Rehabilitative Services (DHRS)
	Birth rate per 100,000 women of child bearing age	DHRS

Table 2 (cont.)

Recommended Utilization Measures

Goals of Education	Utilization Measures	Data Sources
Vocational Competencies	Personal income per capita, per household	FSA
	Unemployment rate	FSA
	Number of recipients of ADC/1000 population	FSA
	Number of persons 16-21 not in school and not in labor force	RRDOE
	Employment status by age, sex, race, training and place of residence	FSA
	Percent of high school graduates employed or engaged in further education	FSA and RRDOE
	Percentage of labor force unskilled	U.S. Dept. of Commerce, Bureau of Census. Census of the Population
Professional Competencies	Number graduating from professional schools by race, sex and program	Board of Regents
Advanced Knowledge and Skills	Number of degrees granted by Florida Institutions of higher learning by specialization	FSA
	Total number of dollars awarded in grant monies to Florida residents	FSA
Research and Development	Percent of the State University System Budget spent on research and development	Board of Regents
	Total dollar amount of Federal grants for research and development in the state	Board of Regents
	Amount spent by private industry within the state for research and development	Board of Regents
Recreation and Leisure Skills	The same recommended for the Aesthetic, Scientific and Cultural goal	

Personnel in the office of Strategy Planning and Management Information System, Department of Education, specified five indicators to be used by this project in making its forecasts:

1. Percentage of armed forces inductees who fail the mental test upon induction
2. Eighth grade test results
3. NAEP reading test results for 13 year-olds.
4. Per capita consumption of printed material
5. Percentage of labor force unskilled.

The fourth indicator was modified, with approval from the Department of Education, to: number of newspaper subscriptions per capita.

SECTION III

Forecasting Model for Social Indicators

One responsibility of the investigators was "to predict the future status of selected social indicators." (Contract R5-175) Futurists make a distinction between the terms "predict and forecast." (Joseph, 1974, Bell, 1975) To predict is to foretell the occurrence of events. To forecast, on the other hand, is to describe trends and probabilities. Accurate predictions require the foreknowledge of future events which was not available to the researchers. But even forecasting is difficult, because probabilistic statements are dependent upon assumptions. The further into the future the forecast moves, the greater the chance that unforeseen contingencies will invalidate or at least modify these assumptions. For example, tomorrow's weather can be forecast with more certainty than next week's. Because of the many factors affecting education and the probabilistic nature of their occurrence, this study will present forecasts rather than predictions.

In order to forecast future trends of social indicators it was first necessary to identify the intervening variables that will affect these indicators and to forecast future trends of these variables. Since these intervening variables are independent in regard to educational outcomes but dependent in relation to forces within society, they were designated as influencing variables and consist of two types: in-school and out-of-school. The use of these variables in forecasting social indicators is analogous to the weather forecaster gathering information on movements of air including the location of cold fronts, determining if the barometric pressure is rising or falling, securing readings on the humidity, etc., as a basis for making a weather forecast.

An illustration of the effect of an out-of-school influencing variable is provided by information in a recently released publication, America's Children 1976: "During 1974, about one in six children in America lived in families whose income was below the official poverty level.. . . This compares with about one in seven children in 1970." (Associated Press, 1976) Research shows that socio-economic status of children is associated with their achievement as measured by standardized test scores. Had the increase in the percentage of children living in poverty been foreseen in 1970, a decline in standardized test scores could have been forecast. Looking ahead, if the percentage of children living in poverty continues to increase, the scores on achievement tests will continue to decline, assuming that other variables remain constant and unless some countervailing actions are taken.

Once the various influencing variables affecting the indicators were identified it was necessary to estimate the probable influence of each variable on each indicator. However, these variables also influence each other and through this interaction have further influence on social indicators of educational outcomes. For example, the socio-economic status of parents influences their level of aspiration for academic achievement of their children and the self-concepts of their children. Those variables in turn influence educational outcomes.

If, for example, ten variables were to be considered in forecasting trends in an indicator, it would be necessary to consider the interaction between and among each of the ten variables and the indicator. Since this would involve 121 dyadic interactions, it would be extremely difficult, if not impossible, for a forecaster to weigh all the interactions. As a result of such complexity, Kane (1972) concluded: " . . . decisions are usually made in truncated spaces by sharply reducing the variables that

will be considered." The cross-impact analysis technique enables a forecaster to minimize this difficulty.

To use the cross-impact analysis technique, it is necessary to construct a matrix. This matrix contains estimations of the probabilities that events will occur. In order to use cross-impact analysis in this study, the variables and the social indicators were treated as events. For example, to treat the variable, students' self-concepts, as an event, one could state that, "the self-concepts of students will decline by 1981." An indicator stated as an event would be, "eighth grade test results will increase by 1981." It was then possible to estimate the impact that the occurrence of one of these events would have on the probability that another event would occur. By assigning values that deal with only two events at a time, it was possible to construct a matrix containing a number of influencing variables and estimates of their effect on each other and on the indicators. Through a computer program it was then possible to forecast the probability that the value of a social indicator will increase over a given period of time. A detailed discussion regarding construction and use of cross-impact matrices is presented in Section V.

A more sophisticated approach to forecasting is represented by trend-impact analysis. Whereas cross-impact analysis can be used to forecast the probability that an indicator will increase or decrease, the trend-impact analysis can forecast the range of probable future values for an indicator. The use of trend-impact analysis requires a computer program which was not available in a language compatible to the computers accessible to the researchers. Trend-impact analysis, building on the principle of cross-impact analysis, forecasts future trends by extrapolating time series data. Unfortunately, such data are not readily

available in education because of the common use of norm referenced tests. This obviates their use in a time series. Furthermore, school districts and the State Department of Education frequently change the criterion referenced tests they use. Statewide use of the NAEP tests over a period of years could generate the time series data base required for trend-impact analysis.

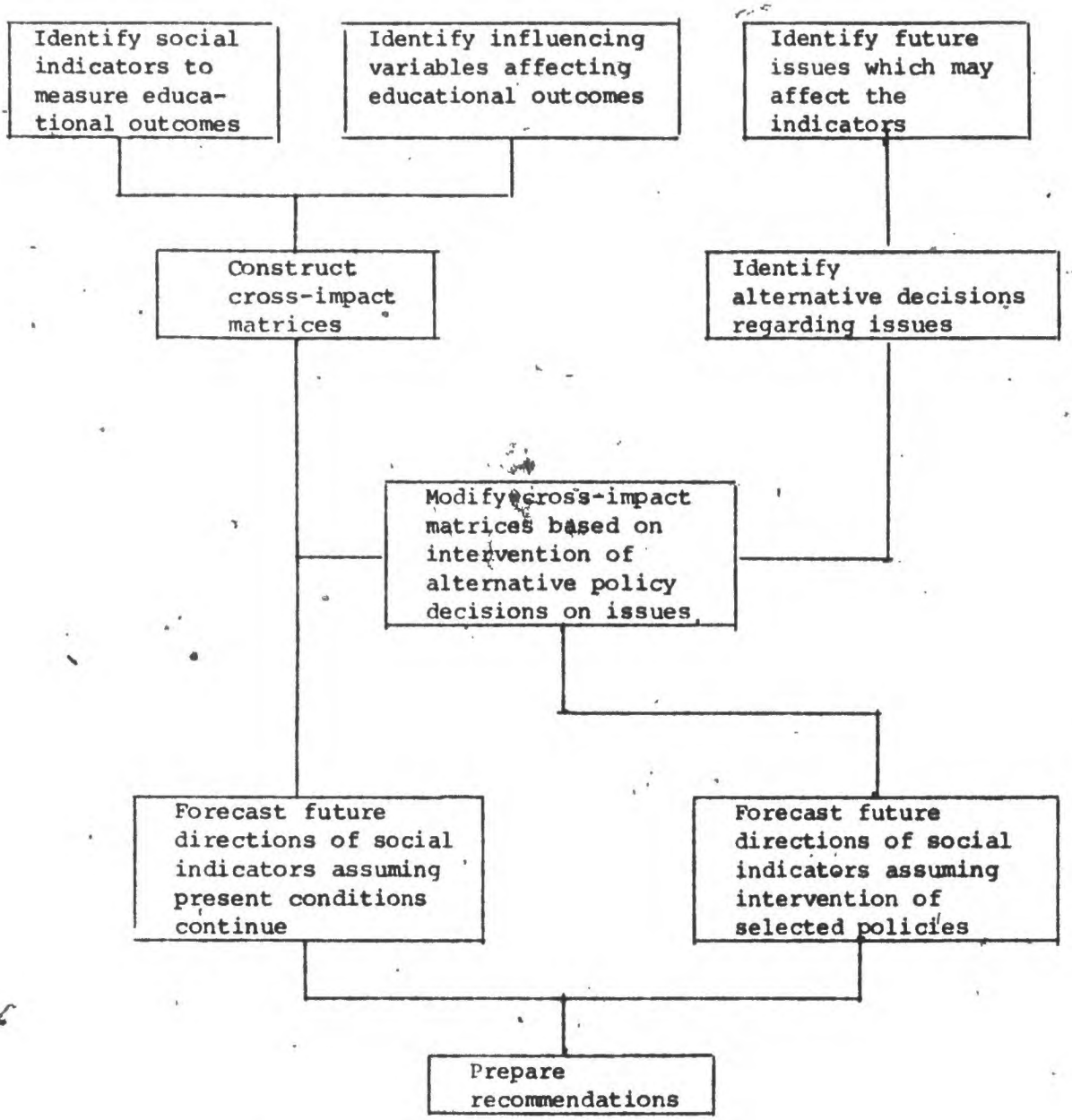
Cross-impact analysis was used in two ways in this project. First, 10 variables affecting educational outcomes were considered and future directions of change on five social indicators were forecast. This application of the cross-impact analysis assumed that present trends would continue. The results of this application are reported in Section V.

The second use of cross-impact analysis was based on the assumption that variables and indicators would be influenced by possible future events. The researchers with the assistance of the faculty panel identified issues that could impinge on social indicators. (See page iii for a list of members of the faculty panel) Alternative decisions in relation to these issues were then proposed. These alternatives were used in cross-impact matrices in order to forecast their impact on indicators. A discussion of the issues and alternative decisions together with the results of using the cross-impact program are contained in Section VI.

Figure 1 is a schematic representation of the forecasting model used in this project. It is important to recognize the limitations inherent in this model. When one considers how often the weatherman fails to make the correct forecast of tomorrow's weather, in spite of excellent sources of data, the hazards of forecasting values of social indicators five years hence become apparent. The forecasting methodology used in this project attempts to avoid making decisions in truncated spaces. At the same time

Figure 1

Forecasting Model for Social Indicators



it is crucial to keep in mind that the entire procedure is based on a series of assumptions regarding probabilities that events will occur and regarding the probable impact of one event on another. Given these limitations, the results should be used to generate an agenda for actions to be taken to improve future educational outcomes rather than to be viewed as a fait accompli. To date, man can do little to change tomorrow's weather. He can, however, influence the quality of education in our society.

SECTION IV

Variables That Affect Educational Outcomes*

Review of research literature

The purpose of this section is to present the basic findings of the review of research literature on variables that affect educational outcomes. This review is not an exhaustive one but it includes the basic studies done in this broad area. In order to attain the objective, primary sources were used as well as previous reviews.

Fducational outcomes are generally divided into two categories: cognitive and noncognitive. The former includes intellectual processes while the latter includes motivation, attitudes, social skills, self-concept, learning styles, etc. Although educators recognize the importance of both kinds of outcomes, most of the research done concentrates on the variables that affect cognitive outcomes, and little research has been directed toward discovering variables associated with noncognitive ones. Furthermore, most of the studies have considered cognitive achievement as measured by standardized achievement tests. Consequently, the available research is directed toward discovering variables associated with cognitive achievement as measured by standardized achievement tests.

Basic approaches. Averch, et al. (1972) classified the research done in this area into five different approaches: (1) the input-output approach; (2) the process approach; (3) the organizational approach; (4) the evaluation approach; (5) the experiential approach.

The input-output approach views the school as a channel through which resources (inputs) flow to the students and from which some output flows,

*This section was incorporated from technical report No. 3.

usually defined in terms of cognitive achievement as measured by standardized achievement tests. The researcher tries to answer the question: To what extent is the variability in educational outcomes due to variations in resource levels? He collects a body of data at a given point in time, usually applies multiple regression analysis and tries to make inferences about the effects of the inputs on the educational outcomes. The Equality of Educational Opportunity survey by Coleman, et al. (1966) is an example of this kind of research.

In the process approach what matters are the processes by which the resources are applied to the students and the responses of the students to those processes. The main purpose of this approach is to expand the knowledge of the nature of educational processes and to determine the factors affecting educational outcomes. The researcher conducts small-scale experiments, either in the laboratory or in the classroom.

The organizational approach assumes that improvement in the functioning of educational organizations, such as schools, results in better educational outcomes. The school is seen as having to adapt to the needs of an ever changing body of students and to changes in outside forces, such as social demands. The inputs are the rules, procedures, incentives and so forth set up within the system. The purpose of this approach is to understand the behavior of the whole system and to describe the structure of the school and how and what happens to the people in it. Research here primarily uses the case-study method. Averch, et al. (1972) pointed out that this approach is relatively underdeveloped as compared with the others.

Studies within the evaluation approach consist of ex post facto analyses of comprehensive educational interventions in existing schools. Researchers that use this approach look for the effects of a general intervention upon educational outcomes. No attempt is made to determine why or how an intervention

affects outcomes. The surveys of compensatory education illustrate this approach.

Those who use the experiential approach are concerned with what happens to students in schools as an end in itself. As Averch, et al. (1972, p. 11) said "the primary emphasis is on the effects of school experiences on student's self-concepts and on their relation to other people and to social institutions." The research within this approach is frequently provided by participant observers in terms of descriptions of their experiences. The works by Silberman (1970), Holt (1967, 1970), and Illich (1971) illustrate this approach.

The literature reviewed for the purpose of this section is representative of all these approaches. For practical purposes, it will be presented in integrated form and no reference will be made to the approach used by specific studies.

Family background. The socio-economic characteristics of the student's family are strongly related to his academic achievement (Armor 1972; Averch, et al. 1972; Bopcock 1966; Coleman, et al. 1966; Jenks 1972; Mayeske and Benton 1975; Mayeske, et al. 1972, 1973; McDill, et al. 1967; Summers and Wolfe 1975). The results are consistent across studies. The higher the socio-economic status of the student's family, the higher his academic achievement and educational aspirations. This relationship seems to hold no matter what measurement of socio-economic status is used. The usual measures, however, are the education and occupation of the head of household.

Averch, et al. (1972) indicated that a student's academic achievement can be predicted approximately 15 percent more accurately if his family's socio-economic status is known. The importance of this factor was described by Coleman, et al. (1966, pp. 21-22) as follows:

> The first finding is that the schools are remarkably similar in the way they relate to the achievement of their pupils when the socio-economic background of the students is taken into account. It is known that socio-economic factors bear a strong relation to academic achievement. When these factors are statistically controlled, however, it appears that differences between schools account for only a small fraction of differences in pupil achievement.

The hypothesis that the role of family background factors in achievement exceeds that of school factors has also been supported by Armor (1972); Jenks (1972); Mayeske, et al. (1975); Smith (1972).

There is little evidence to support the assumption that the structure of the family (the size of the family, number of parents in the home, etc.) exercises a strong independent influence on the student's achievement. After an extensive and complex analysis of the data of the Equality of Educational Opportunity survey carried out by the U.S. Office of Education, Mayeske and Benton (1975, p. 125) concluded that:

> For most students, the relationship of family structure with achievement tends to be moderate or low. Most of this relationship can be accounted for by variation in socio-economic status: the lower it is, the less likely the family is to remain intact.

Although it is generally accepted that family expectations, attitudes and aspirations regarding life and education have a strong influence upon the student's achievement, this has not been well substantiated by empirical evidence. Little has been done in clarifying the nature and strength of this relationship. The strongest support comes from the work by Mayeske, et al. (1972). They studied a series of variables in what they referred to as "Family Process Set" and discovered that the ones with the strongest relationship with achievement were educational plans and desires and attitudes toward life. They also found that both relationships persisted even after all the other variables had been taken into account. Mayeske, et al. concluded that their study demonstrated that family background plays an

important role in the student's achievement, not only through social and economic well-being, but through the values its members hold regarding education and the activities that parents or caretakers engage in with their children to make these values operational.

Sex. One may expect differences in achievement between sexes if cultural influences such as role expectations, social norms and other sex-related personality characteristics are considered. Khan (1976) presented evidence which indicated that correlations between predictors and achievement for females are higher than similar correlations for males. Simons and Bibb (1974) found significant sex differences in underachievement: that is, there were more male underachievers than females. Summers and Wolfe (1975) pointed out that a student's sex is related to his achievement at all school levels. In elementary school, they found that females do better than males. In junior high school, only low ability males do more poorly than low ability females. In senior high school, males of average ability or less do better than females with equivalent ability. On the other hand, in their extensive analysis, Mayeske and Benton (1975) found that sex is not a major source of differences among students in achievement and motivation. Thus there does not seem to be a clear relationship between sex and achievement.

Racial-ethnic group. The existence of ethnic differences in educational achievement has been pointed out by many studies (Armor, 1972; Coleman, et al. 1966; Boocock, 1966; Pollard, 1973). Negro students and other minority groups are lower in academic achievement than white students. This relationship seems strong when certain other variables are not controlled or taken into account. Armor (1972) and Mayeske, et al. (1973) indicated that most of these differences can be explained in terms of family background.

Mayeske, et al. (1973, p. 147) found that when "Family background, area of residence and various aspects of the school attended were taken into account, the degree of variations in achievement that could be attributed to racial-ethnic group membership dropped to 1 percent or less."

On the other hand, Jensen (1969) provided evidence that supports the importance of racial membership in the student's achievement. He indicated that there are innate differences in ability between different racial groups. His findings and his inferences are a matter of much controversy and more research is needed before any valid conclusion can be reached.

Thus it seems that we cannot make inferences about the independent effect of racial-ethnic group membership in achievement and motivation by our present state of knowledge.

Region and type of community. There are some indications that the region and the type of community in which a student lives affects his educational outcomes. The National Assessment of Educational Progress indicates differences in student's academic achievement and attitudes between different regions in the United States (Johnson, 1975). Boocock (1966) described a study done by Rogeff in which it was found that there was a relationship between the structure of the community and the educational aspirations and scores on a scholastic aptitude test of a group of students. She also pointed out that the Project Talent data suggest that different types of communities may foster or emphasize different types of achievement by able students.

On the contrary, Mayeske and Benton (1975) found that the region of the United States in which a student resides has little effect on his level of achievement or motivation. Regional membership was found to account for only about 5 percent of the total student variations in academic achievement. They also concluded that the observed regional differences

in academic achievement can be explained in terms of the regional averages in socio-economic status, motivation and type of school attended, either singly or in any combinations.

School resources and facilities. Most studies generally agree that school resources and facilities account for relatively little variation in pupil achievement (Armor 1972; Averch, et al. 1972; Coleman, et al. 1966; Jencks 1972; Lyle 1967; Mayeske, et al. 1972, 1975; McDill, et al. 1967). Most studies refute the notion that per pupil expenditures are the key determinant of pupil achievement. The lack of evidence of the influence of school resources and facilities on the student's achievement was indicated by Averch, et al. (1972, p. 148) as follows:

> When we examine the results across studies we find that school resources are not consistently important. The particular resources that seem to be significant in one study do not prove to be significant in other studies that include the same resources in the analysis.

Coleman, et al. (1966) pointed out that variations in facilities and curricula of schools usually account for little variation in student achievement; however, they account for more variation of student achievement within minority groups than within the majority white group.

One of the variables that has been considered in some of the studies is class size. Reviewing the literature of the relationship between class size, and achievement, Boocock (1966) concluded that research in this area is rather inconclusive. McDill, et al. (1967) found a low correlation between this variable and the academic achievement of the students. On the other hand, Summers and Wolfe (1975) found a relationship between class size and achievement. They found that classes of 27 or fewer were helpful for low-ability elementary students and that classes of 34 or more appeared detrimental to everyone.

Another variable that has been considered by some researchers is school size. In this case, as well as in class size, the results across studies are inconsistent. Boocock (1966) presented some studies which reveal contradictory findings. One step toward a better understanding of the relationship between school size and student achievement was carried out by Summers and Wolfe (1975). Analyzing this relationship by different groups of students, they found that the effect of the size of the school varies with the kind of students. Smaller schools apparently were associated with higher achievement particularly for elementary and senior high students. Black and elementary school students and low-ability high school students seemed to benefit most from smaller schools. The type of analysis they followed in clarifying this relationship as well as others seems fruitful, although their findings are far from being conclusive.

Teacher characteristics. In their extensive review of literature, Averch, et al. (1972) found that although there is considerable research conducted on teacher characteristics and their influence on student performance, little can be concluded from them. They indicated that one of the limitations in these studies is that student achievement has rarely been used as a criterion. Other criteria, such as supervisor's or fellow-teacher's ratings, are not appropriate since these ratings do not correlate with student achievement.

Of the teacher characteristics studied, there does seem to be evidence that the teacher's training and experience are related to student achievement (Boocock, 1966; Coleman, et al. 1966; Lyle 1967; Mayeske, et al. 1972; Summers and Wolfe 1975). Coleman, et al. (1966) found that the quality of teachers shows a strong relationship to pupil achievement. They also found that this relationship is progressively greater in higher grades, indicating a cumulative effect of teacher qualities in the student's

academic achievement. The teacher quality appeared to be more important to minority than to majority students. Among the teacher characteristics measured in the survey, those that had the highest relationship to student achievement were, first, the teacher's score on the verbal skills test and then his educational background.

In their reanalysis of the data used by Coleman, et al., Mayeske, et al. (1972) found that teacher attributes highly related to the school outcomes were those associated with the teacher's experiences in racially imbalanced educational settings. Black teachers attended predominantly non-white educational institutions. The result is a less adequate preparation than that received in predominantly white institutions.

In the study done in Philadelphia public schools, Summers and Wolfe (1975) found that students in elementary school did better with teachers from higher rated colleges and universities, especially those students in the low income group. They also found that the length of experience of the teacher had a different impact on high and low-achieving students. At all school levels, high achievers were found to do best with more experienced teachers. Surprisingly, low achievers in elementary school were found to do best with relatively inexperienced teachers. Education of the teacher beyond the bachelor's degree was not related to better student achievement.

Teacher-student interaction. The state of knowledge about teacher-student interaction and its influence on student's educational outcomes was described by Boocock (1966, p. 8) as follows: "There does not seem to be any one type of teacher or teacher-student relationship that is best for all kinds of learning and all kinds of students." A similar conclusion was presented by Averch, et al. (1972) who found studies that indicated that some teachers do better with certain types of students and that there is no single best or right way to teach.

In a review of literature, Soar (1972) found a relationship between teacher indirectness (student freedom) and criticism and student educational outcomes. This relationship is not linear and is rather in the form of an inverted "U".

> Up to some point, increasing indirectness leads to greater subject matter growth and more favorable attitudes, but beyond that point, further increases in teacher indirectness lead to decreased subject matter growth and less favorable attitudes. (p. 187)

The appearance of an inverted "U" in the relationship between teacher control and student growth suggests the possibility that more than one process or mechanism is involved in this relationship. This phenomenon should be studied more carefully by educational researchers.

Soar (1972) also found that the research in this area suggests that the kind of teacher behavior is associated with the level of complexity of the achievement. Gain in simple concrete kinds of achievement, such as memory of facts, is positively related to closely supervised classroom activity; whereas, gain in more complex abstract achievement, such as development of concepts and principles and creative work, is positively associated with greater amounts of student freedom.

Rosenthal and Jacobson (1968) pointed out the importance of teacher expectations on student educational outcomes. However, their research has been critized in its methodological aspects and more recent studies have failed to replicate their findings. Dusek and Connell (1973) found as a result of their study that neither biasing statements nor false test scores given to teachers affect children's test scores. However, they point out that the findings suggest that teachers' own expectations of student's performance are related to the way teachers treat different groups of students. This may influence student's self-concept and classroom performance.

Averch, et al. (1972) concluded that studies suggest that teacher expectations probably influence teacher and student behavior and may influence student achievement, but that more research is needed to determine the strength and nature of this relationship.

Student-body characteristics. The literature about the influence of the student-body (peer group) on the academic performance of individual members presents inconsistent findings. In the Equality of Educational Opportunity survey, Coleman, et al. (1966) concluded that a student's achievement is strongly related to the educational backgrounds and aspirations of other students in the school. Children from a given family background will achieve at different levels when put in schools with different social composition. In their reanalysis of Coleman's data, Mayeske, et al. (1973) corroborated these conclusions. They also found that although there is considerable correlation between the achievement-motivational composition and the social composition of the student-body, the former has the greater influence. Consistent with these findings, McDill, et al. (1967) found that in those schools in which academic competition, intellectualism and subject-matter competence are emphasized and rewarded by faculty and student-bodies, individual students tend to achieve at higher levels.

Summers and Wolfe (1975) presented data that support the influence of the student-body characteristics on the academic achievement of individual members. They found that the proportion of either high achievers or low achievers in a school can influence the student's school performance. The more heterogeneous the composition of the student body was in terms of abilities, the higher the achievement of the student body. They also found that both black and non-black students tend to have higher achievement

levels when schools are racially balanced than when they are mostly segregated.

On the other hand, Smith (1972), after a reanalysis of Coleman's data, concluded that there is no evidence that the characteristics of the student body have a strong independent influence on the achievement of individual students. He concluded that the student selection and school assignment policies cause the association between student body characteristics and achievement.

In their review of literature, Averch, et al. (1972) concluded that there is no strong evidence to support the hypothesis that student-body effects exist nor is there strong evidence to the contrary. They added that the controversy over the existence of student-body effects results from research methological considerations.

> So long as production-function research is based on data generated by natural experiments, it will be difficult, if not impossible, to isolate completely the relative contributions of school resources, background factors, and peer-group influences. (p. 44)

Thus it seems reasonable to conclude that the role of the student body on the achievement of individual students is not yet known. At the same time, the existence of student-body effects on student academic achievement is hypothesized.

Student's self-concept. The student's self-concept, or what the student believes he is, has been studied in terms of influence on school performance. In his review of this research literature, Purkey (1970) found that the relationship between the self-concept and academic achievement can be divided into three categories: (1) the relation between the self-concept and success in school; (2) how the successful student views himself; and (3) how the unsuccessful student sees himself. He found that the research clearly indicates "a persistent and significant relationship

between the self-concept and academic achievement." (p. 15) The relationship is clear for boys but less so for girls. Successful students are generally characterized by positive self-concepts and tend to excel in feelings of worth as individuals. On the contrary, underachievers, non-achievers, or poor readers are likely to see themselves as less able, less adequate and less self-reliant than their more successful peers.

In a study of educational achievement and ethnic group membership, Pollard (1973) found that the only personality variable that correlated consistently with achievement in all five ethnic groups was the self-concept of ability. It was the only variable that differentiated high achievers from low achievers in both reading and arithmetic.

Though research in the self-concept has many limitations, it seems clear that this variable influences student educational outcomes.

Student's general ability. Although most people agree that general intelligence or ability influences academic achievement, this generalization is a matter of some controversy among researchers. Low correlations between mental test scores and learning have been found in some studies (Cronbach, 1970). On the other hand, some authors have pointed out that general ability appears to be the single most effective predictor of school achievement (Entwistle, 1972; McDill, 1967). Cronbach (1970, pp. 293-294) explained this inconsistency of findings in terms of the kinds of learning considered.

> First, it is true that in instruction that presents connected materials - whether by a programmed text, a live teacher or some more exotic method - the pupils high in mental age learn more than those low in mental age. Hence MA does represent one kind of ability to learn. When, however, the material is rote in nature, and no meaning can be supplied by the learner (as in many laboratory tasks) good general ability gives little or no advantage. There is some reason to think that rote memory is a separate ability. Good performance on a truly rote task may occur as often among those we call 'dull' as among the bright.

Cronbach (1970) also presented evidence of interactions between general

ability and instructional method. Instructional methods or treatments can be found to be differentially effective on the basis of the level of the student's general ability. This can explain in part the failure in educational research to demonstrate positive effects due to new treatments or instrutional innovations.

Other student's attitudinal and motivational factors. In the Equality of Educational Opportunity survey, Coleman, et al. (1966) found that a set of three attitudinal measures accounted for more achievement variability than any other set of variables. These attitudinal measures were (1) the student's interest in school and his reported reading outside school; (2) the student's self-concept, especially with regard to learning and success in school; and (3) the student's sense of control over his own destiny. Of these attitudinal measures the one that was found to have the strongest relationship to achievement was the student's sense of control over his own destiny.

In their reanalysis of the data used by Coleman, et al., Mayeske, et al. (1973) found evidence that supports the existence of a relationship between student's attitudinal and motivational factors and academic achievement. Among these factors the most important were the student's expectations of his performance in school and his attitudes as to the importance of hard work for success and how an education might benefit him.

A particular aspect of motivation that has been considered in many studies is achievement motivation or the need to achieve. Although this variable has frequently been associated with school performance, a consistent direct relationship has been difficult to demonstrate. Pollard (1973) indicated that this is due partially to the problem in conceptualization and partially to the possibility that other variables mediate the effect of achievement motivation.

In a review of research about the prediction of achievement from a measure of achievement motivation, Klinger (1966) reported that of five studies, two report that children with high achievement motivation scores had significantly higher achievement than those with low scores in achievement motivation. The other three studies report that achievement motivation scores did not differentiate high from low achievers.

In a recent study, Simons and Bibb (1974) estimated what they called a "resultant achievement motivation index." This index was obtained by combining an individual's need to achieve with his test anxiety score and was supposed to represent a single measure of overall motivational character. It was discovered that the resultant achievement motivation index was associated with student achievement. This index is interpreted in terms of hope of success or fear of failure. The authors concluded that "the hope of success was significantly associated with high or superior academic achievement while fear of failure was significantly associated with underachievement." (p. 366)

Summary and critique of research on variables

Most research has demonstrated that the largest percentage of the variance in student's educational outcomes is associated with student characteristics. Student's socio-economic status as well as his self-concept, other attitudinal and motivational factors and his general ability seem to be very important in explaining variability in student academic achievement. On the other hand, a small percentage of that variance has been associated with school variables. Research has not identified a set of educational practices and/or resources that consistently relate to student's educational outcomes. A practice that seems to be effective in one case is apparently ineffective in another.

This does not mean that school does not affect student educational outcomes. Most research compares variables and educational outcomes across schools and little knowledge is available as to what student's outcomes would be in case they do not attend school at all. There is a need to explore further the influence of the school on some of the variables that have been proved to be strongly associated with academic achievement, such as self-concept, ability and other attitudinal and motivational factors. It is possible that the school affects student's outcomes in many indirect ways.

There have been few studies on the effect of the interactions between student variables and school variables on student's outcomes. Soar (1975) found interactions between pupil socio-economic status and achievement gain for several kinds of teacher behaviors. For example, " . . . teacher criticism of pupil work is negatively related with achievement gain for low SES pupils, but not for high SES pupils; whereas a warm, supportive atmosphere is positively associated with gain for low SES pupils but not for high SES pupils." (p. 3) Summers and Wolfe (1975) studied the question of the interaction between specific school resources and specific types of pupils. As a result they found more strong school influences on student achievement than in previous studies. Previous research mostly considered the relationship between school variables and the outcomes of all students. Thus it is possible that the positive influence of the school on certain kinds of students may be cancelled by the negative influence on other kinds of students and in this way school influences may be hidden. It is hoped that future researchers following and improving on Summers' and Wolfe's research methods will be able to discover the influence of school in student educational outcomes.

The available research also is limited in other ways. The educational outcomes considered are almost exclusively those associated with cognitive achievement, but this is only one aspect of student learning. Furthermore, research considers cognitive achievement as measured by standardized tests. These instruments are limited since they measure a narrow range of cognitive skills, mostly the lower cognitive processes. Higher cognitive processes such as abstract reasoning, problem solving and creativity, among others, are rarely measured very well by standardized tests. Thus of a wide variety of educational outcomes, available research examines only a narrow range of cognitive skills.

Few studies maintain adequate controls over possible variables that can affect achievement, especially variables associated with what goes on in the classroom (Averch, et. al., 1972). Most studies do not include data on interactions between student-teacher, student-student, student-subject-matter, teacher-subject-matter, student-teacher-subject-matter and so forth.

Many variables are measured in crude form. Variables such as teacher quality, teacher's ability, student's motivation, etc. are theoretically understood but are difficult to measure. Therefore, we do not know the extent to which inconclusive findings are the result of the researcher's inability to measure the variables included in his analysis.

In general the available research has identified the following as possible sets of variables that affect student educational outcomes:

<u>Strong support from research</u>

Socio-economic status
Student's general ability.

<u>Some support from research</u>

Family expectations, attitudes and aspirations
Peer group characteristics (student-body)
Student's self-concept
Student's attitudinal and motivational factors (including fate control)

Teacher training
Teacher experience
Teacher expectations
Teacher behavior in the classroom.

Variables to be used in the forecasting model

Given the inconclusive nature of the research, a panel of experts of the University of Florida faculty was asked to assist in identifying the variables to be used in this study. The list of variables influencing educational outcomes identified through the review of the research was used as the basis of a modified Q-sort. The panel was asked to scrutinize the list and suggest additional variables which should be included. Discussion of the variables by the panel resulted in the following additions to the list:

Teacher academic standards - as differentiated from the teacher's expectations of student's learning ability

The normative system of the school

Administrative leadership.

Student's fate control was identified as a separate variable.

The resulting list of 14 variables was then sorted by each panel member in a four-step forced-choice procedure to yield the single variable each judged to be most significant in influencing school outcomes. The next day a tabulation of the results of the first sorting was presented to the panel and discussed. Each member was given the opportunity to change his choice as a result of his observation of the tabulated results and the ensuing discussion. The tabulation of the final sort was scored using a reciprocal weighting system (see Appendix A). The ordering of the variables through the modified Q-sort was closely congruent with the results of the research review.

The ten variables having the highest rating were selected to be used as components of the cross-impact matrices. These ten variables are listed below with a brief explanation:

1. Socio-economic status of the family - usually measured by level of education and occupation of head of household

2. Family expectations, attitudes and aspirations - the way parents and other family members feel about education and toward life

3. Student's self-concept - the way the student sees himself

4. Peer group characteristics - academic achievement, race and attitudes toward school and learning

5. Student's general ability

6. Student's fate control - individual's sense of control over his own destiny, his ability to influence the course of his life (locus of control)

7. Administrative leadership style

8. Teacher expectations regarding learning ability of specific students or classes

9. Teacher behavior in the classroom - how the teacher actually carries out the tasks of teaching

10. Student's attitudes and motivation - attitudes toward his performance in school and his motivation for achievement.

SECTION V

Forecasts of Trends in Social Indicators of Educational Outcomes

One purpose of this study was to forecast the trends of five social indicators of educational outcomes. The indicators were selected by personnel in the Department of Education for use in the forecast. In the previous section, ten variables that research indicated may influence these social indicators are described. In order to forecast trends in the values of indicators it was necessary to estimate what the trends of these variables would be. Then the interactions among the variables and the indicators could be estimated and a more reliable forecast made. As stated in Section III, the cross-impact analysis technique was used to generate data as a basis for forecasting.

Cross-impact analysis is a modification of the Delphi forecasting technique. It enhances the power and reliability of the Delphi technique through the use of a matrix and a computer program which helps analyze the data in the matrix. Delphi uses an iterative process to obtain consensus among a group of experts regarding the probability of occurrence of some future event or set of events. Cross-impact analysis retains the use of a panel of experts to estimate the probability of occurrence of a series of events. By placing these probabilities in a matrix and utilizing a computer program it is possible to systematize the analysis of the interactions between events. The solution which results is approximate rather than absolute, but it does extend the power of human judgment. The construction and use of cross-impact matrices is discussed in the pages which follow.

Illustration of cross-impact analysis

The nature and use of a cross-impact analysis can be described through an examination of the matrix presented in Table 3. The illustration concerns a

Table 3

Hypothetical Cross-Impact Matrix for Forecasting
Modes of Transportation by 1990

Events	Initial Probability	Conditional Probabilities		
		1	2	3
1. Auto use continues to increase through 1990	.75	-	.80	.15
2. An acute shortage of fossil suels occurs by 1990	.50	.25	-	.60
3. All major U.S. cities have rapid mass transit systems in operation in 1990	.25	.65	.40	-

hypothetical forecast regarding modes of transportation by 1990. In any cross-impact matrix the initial probabilities are determined through research findings and consultation with experts in the field under consideration. The initial probability represents the estimation that an event will occur independent of all other events. In the hypothetical matrix, Table 3, it is estimated that the probability that auto use will increase through 1990 is .75. Probability may also be stated as the odds on the occurrence of an event where these odds are equal to the probability that an event will occur divided by the probability that it will not occur. $\left(\frac{\text{Probability}}{1 - \text{Probability}}\right)$ In the auto use example the odds = $\frac{.75}{1-.75}$ = 3 or 3 to 1. The initial probability of event 2, an acute shortage of fossil fuels by 1990 is .50, or odds of 1 to 1, indicating an even chance for this event to occur by 1990. Event 3, all major U.S. cities have rapid mass transit systems by 1990, is thought to be less likely than the other events and has been assigned an initial probability of .25.

The underlying concept of cross-impact analysis is that the initial probability of the occurrence of an event will be modified by the impact of other events in the set included in the matrix. These probabilities are

called conditional probabilities and are inserted in the matrix at the appropriate intersections. The events are arranged so that the rows and columns have the same events in them; for example, auto use is found in row 1 and column 1. In the example shown in Table 3 the events are thought to have no impact on themselves so a dash has been inserted in the cells where each event impacts itself. Beginning with the top row and the second column the meanings of the conditional probabilities are as follows: .80 - If auto use does continue to increase through 1990, the impact of that event on the probability of a fossil fuel shortage is to increase it from .50 to .80: .15 - If auto use continues to increase, the probability that all major cities will have mass transit systems in 1990 declines somewhat from .25 to .15. The conditional probabilities in row 2 have the following meanings: .25 - The impact of an acute shortage of fossil fuels on the growth of auto use reduces the initial probability of that event from .75 to .25: .60 - An acute shortage of fossil fuels by 1990 will increase the probability of urban rapid mass transit in all major cities from .25 to .60. The meanings of conditional probabilities in row 3 are: .65 - If all major U.S. cities do have rapid mass transit systems by 1990, the probability that the use of the auto will increase is reduced from .75 to .65: .40 - If all major cities do have rapid mass transit systems by 1990, the probability of an acute shortage of fossil fuels is lessened somewhat from .50 to .40.

This cross-impact matrix was analyzed by a computer program. The program derives an approximate solution for new or "calibrated" probabilities for each event. It takes into account each of the conditional probabilities and their impacts on the initial probabilities assigned to each event. The workings of the program are described in greater detail later in this section.

The analysis of the sample matrix resulted in changes in the initial probabilities of each of the events. The probability that auto use will continue to increase through 1990, initially set at .75, was "calibrated" to a final probability of .59. The diminution in the probability of this event indicates that the impacts of the other two events on it are strong enough to lessen the likelihood that it will occur. The probability that there will be an acute shortage of fossil fuels by 1990 increased from .50 to .62, indicating that this event is more likely to occur than was initially forecast. Finally the probability that all major U.S. cities will have rapid mass transit facilities in operation by 1990 also increased. It had an initial probability of .25, but when the impacts of the other events are taken into account, the computer increased its probability to .33.

The illustration shows how a cross-impact matrix is constructed and explains the meaning of the probabilities. However, it includes only three events and consequently does not give a clear picture of the power of the technique. Most experts can easily perceive the interrelationships among three events and can explore them in their own consciousness without artificial aids. Consider how different the situation would be if the entire set of events impinging on the transportation market were included. Ten, fifteen, or perhaps more events would have to be included in such a matrix. If there were fifteen events the number of paired interactions would be 225. Keeping all of them in mind would test the mental powers of any thinker. In such situations the cross-impact matrix is of considerable value. In combination with the computer program which can show how the interactions among event pairs would affect the initial probabilities, the matrix becomes a powerful tool with which to explore alternative futures. This is the essence of cross-impact analysis. The pages which follow describe in detail how the technique was used in this project.

The use of cross-impact analysis in this project

Table 4 is the matrix that was used to generate data regarding one of the social indicators -- NAEP Reading Test results for thirteen year-olds. Note that the matrix deals with events. Thus, each variable is stated as an event -- e.g., students' self-concepts will decrease by 1981. Similarly, the indicator is stated as an event -- the scores on the NAEP test for thirteen year-olds will increase by 1981. As with the illustration the numbers assigned to the columns correspond to the events given the same number in the rows. Thus, Column No. 5 refers to the event: students' self-concepts will decrease.

Estimation of initial probabilities. The assignment of initial probabilities to the events is an important first step since these values will have a major influence on the forecasts generated. These probabilities should be based on data about trends in the influencing variables and the impact that those influencing variables have on the social indicators. Unfortunately, little of this information was available. With the exception of socio-economic status, time series data about the variables were not available. Even the data about socio-economic status have many limitations since the levels of income, occupation and education characteristic of different socio-economic status change through time. Nevertheless, the available data suggest that during the past few years the percentage of children living in low socio-economic status has increased. As pointed out in Section III, one out of seven children was living in poverty in 1970, whereas one in six children in American was living in poverty in 1974. (Associated Press, 1976) Furthermore, the difference in income between classes is increasing as can be seen in Table 5.

Table 4
Cross Impact Analysis Matrix for
NAEP Test Results

Event	Initial Probability	Conditional Probabilities										
		1	2	3	4	5	6	7	8	9	10	11
1. Family expectations, attitudes & aspirations will decline	.64	-	.63	.62	.62	.63	.74	.68	.61	.42	-	.41
2. Peer group expectations, attitudes & aspirations relative to education will decline	.54	.65	-	.61	-	.57	.74	.70	.58	.40	-	.41
3. Percent of children living in poverty will increase	.60	.68	.61	-	.67	.65	.72	.72	.60	.42	.49	.36
4. Students' ability as measured by IQ tests will decrease	.61	.60	.55	.64	-	.60	-	-	.58	.44	-	.40
5. Students' self-concepts will decrease	.56	.61	.60	.67	.59	-	.72	.74	.57	.44	.49	.40
6. Students' attitudes & motivation towards school will decrease	.65	.67	.67	.65	.54	.59	-	.65	.59	.43	-	.39
7. Students' sense of control of their own fate will decline	.63	.66	.63	.67	.66	.71	.76	-	.56	.43	.49	.41
8. Teacher expectations of pupil performance will decline	.55	-	.61	.67	.59	.64	-	.62	-	.45	-	.39
9. Leadership styles and organizational climate of schools will improve	.41	.56	.47	.53	.54	.48	.50	.51	.46	-	.67	.53
10. Teacher behavior with respect to instructional practices will improve	.50	.54	.50	-	.51	.48	.50	.51	.47	.46	-	.60
11. NAEP test results for 13 year olds will increase	.50	.54	.49	.52	.49	.46	.49	.48	.45	.49	.54	-

Table 5
Ratio of Mean Income of the Highest Fifth to the Lowest Fifth of Families: 1968-1971, U.S.A.

Year	Ratio Highest Fifth to Lowest Fifth
1968	7.14
1969	7.32
1970	7.56
1971	7.56

Source: Social Indicators, 1973 prepared by the Office of Management and Budget of the Executive Office of the President.

Ranges of probabilities of the impact of the variables on the social indicators were impossible to establish based on the available data. Different studies have used different statistical analysis of their data having established relationships in terms of probabilities in some cases and in terms of percentages of variance in others. Also, the findings in many cases are very consistent. Furthermore, the data available are limited to relationships between influencing variables and standardized test results. Relationships between these variables and other social indicators have rarely been considered. However, in this project it was assumed that the variables affecting test results would also affect other variables.

The lack of data regarding past trends in variables made the task of forecasting their future difficult. The researchers were able, however, to draw on the varied experiences of members on the faculty panel in assigning initial and conditional probabilities. After sharing relevant information with each other, members of the panel estimated the probability that each of the events listed in the matrix would occur by 1981 which was the time frame used for this forecast. The mean score of their estimation was used as the initial probability. The initial probability assigned to the social indicators was

always .50. In other words, the assumption was made that there was a chance probability, or one-to-one odds, that the indicator will increase in value.

Estimation of conditional probabilities. The second step was to estimate the impact that each event would have on each other event, that is, to assign conditional probabilities. In order to make this estimation, a series of questions were asked, in the form: "If in fact event No. 1 occurs, how will this affect the probability that event No. 2 will occur?" In Table 4, for example, if in fact family expectations, attitudes and aspirations do decline (event No. 1), how will this affect the probability that peer group expectations, attitudes, and aspirations (event No.2) will decline? The estimation that was made indicated that the occurrence of event No. 1 would increase the probability that event No. 2 would occur. Thus, the initial probability of .54 was increased to .63 (the first cell in the second column). The faculty panel provided the estimations of impacts.

Column 11 of Table 4 shows the estimates of the impacts of each of the variables on the social indicator. Thus, it was estimated that if in fact students' self-concepts decrease the probability that the scores on the NAEP test for thirteen year-olds will increase would decline. Thus, the conditional probability assigned is .40 somewhat less than the initial probability of .50. (the fifth cell in column No. 11). The estimation of impacts on the indicator is particularly important to the results. The faculty panel had read the review of the research contained in Section IV of this report prior to making their estimations of these impacts.

Computer analysis of the matrix. After the initial and conditional probabilities had been assigned, a computer program based on Bayesian statistics and using Markov chaining and the Monte Carlo technique was used to improve the estimated initial probabilities of all the events. The computer program, developed by the Futures Group, uses the ratios between the initial probabi-

lities and the conditional probabilities to determine the odds for the occurrence of an event. Then it selects a random number between 0 and 1 and compares it to the initial probability of a randomly selected event to determine if the event occurs or not. If the event occurs new odds ratios are calculated for every other event on which it has an impact. Then another event is selected at random and its new initial probability, based on the adjustment in the odds ratio is compared with a random number and the whole process is repeated. The program allows the user to specify how many times the whole set of events is analyzed in this way, 1200 is thought by the program's authors to be optimal. The result of such a computer run is a new set of probabilities calibrated to take into account the impacts of all the events upon each other. These calibrated probabilities can be used as a basis for forecasting on the assumption that they more closely represent the actual probability of an event than the first estimates.

Table 6 shows the results of the cross-impact analysis of the matrix shown in Table 4 based on 1200 iterations. The initial probabilities in Table 6 correspond with the initial probabilities in Table 4. The calibrated proba-

Table 6
Calibration Results for
Matrix in Table 4

EVENTS	INITIAL PROBABILITIES	CALIBRATED PROBABILITIES	DELTA
E 1	0.64	0.60	-.04
E 2	0.54	0.66	0.12
E 3	0.60	0.68	0.08
E 4	0.61	0.57	-.04
E 5	0.56	0.60	0.04
E 6	0.65	0.69	0.04
E 7	0.63	0.68	0.05
E 8	0.55	0.57	0.02
E 9	0.41	0.48	0.07
E 10	0.50	0.54	0.04
E 11	0.50	0.17	-.33

bilities are modifications made by the program in light of all the interactions among the events. Delta represents the difference between the initial probability and the calibrated probability. For example, according to the computer analysis, a better estimation of the probability that peer group expectations, attitudes and aspirations will decline (E2) is .66 instead of .54, given the impacts of the other ten events on event No. 2.

Of particular interest is event 11 -- NAEP Reading Test results for thirteen year-olds will increase by 1981. According to the computer analysis the cross-impact data indicate that a better estimation of the probability that scores will increase is .17 instead of .50 as initially assigned. This can be stated another way by saying: Assuming that the interacting variables designated by events 1-10 in Table 4 have the probability of occurring as represented by the calibrated probabilities, then the probability that NAEP Reading Test results for thirteen year-olds will increase should be 0.17 rather than .50. Stated as odds, the odds are only 1 to 4.88 ($\frac{.17}{.83}$ = .2048, or 1 to 4.88) that the scores will increase rather than the originally assumed even odds of 1 to 1.

It should be emphasized that this solution is indeterminant. The computer program only approximates the actual value since a sampling technique is used. In fact, if the same matrix is analyzed in another computer run the values of the calibrated probabilities can vary slightly (usually not over .02).

Table 7 shows the result of analyses of matrices containing each of the five indicators. Initial and conditional probabilities for events 1 to 10, the variables affecting educational outcomes, were the same for each matrix. The five different social indicators were considered in turn as Event 11.

Table 7
Calibrated Probabilities of Occurrence of
Increase in Social Indicators

Social Indicator	Initial Probability	Calibrated Probability	Odds
NAEP reading scores for thirteen year-olds will increase	.50	.17	1 to 4.88
Eighth grade test results will increase	.50	.16	1 to 5.25
The percentage of the labor force that is unskilled will decrease	.50	.24	1 to 3.17
The per capita circulation of newspapers in Florida will increase	.50	.26	1 to 2.85
The percentage of armed forces inductees from Florida who fail the mental tests upon induction will decrease	.50	.19	1 to 4.26

The results shown in Table 7 indicate that the odds that indicators will increase are relatively small with the two indicators most closely associated with schools (the first two in Table 7) having the poorest odds of increasing.

Obviously the initial and conditional probabilities assigned will largely determine the outcome obtained by computer analysis. For example, the researchers constructed a matrix that was very optimistic by changing events 1 through 8 from negative statements to positive statements and increasing the initial probabilities for events 9 and 10 from .41 and .50 to .55 and .60 respectively. The rest of the matrix was unchanged. When this matrix was run on the computer there was a dramatic difference. The calibrated probability that there would be an increase in NAEP reading test scores moved to .97, .47 above the initial probability. In other words, the odds that the scores would increase moved up from one to one to thirty-two to one!

Forecasts of social indicators

Based on the data generated by the forecasting model, the researchers forecast that the five social indicators will decrease over the next five year period. These indicators are:

1. NAEP Reading Test scores for thirteen year-olds
2. Eighth grade test results
3. Percentage of the labor force not designated as unskilled
4. Circulation of newspapers in Florida per capita
5. Percentage of armed forces inductees in Florida who pass the mental tests on induction.

The researchers hope that subsequent events will prove them incorrect. Four of these five forecasts can be verified by accumulating appropriate data. The indicator related to armed forces inductees cannot be verified because comparable data are no longer being collected.

What effect would changing the basic assumptions have on the forecasts? As indicated above a "rosy world" forecast has a dramatic effect. The impact of various other assumptions on the indicator, NAEP Reading Test scores for thirteen year-olds, were tested. The first assumption was to suppose that events under the direct control of the school would be very likely to occur. They were assigned correspondingly high initial probabilities. The following changes were made in initial probabilities of the matrix in Table 4.

8. Teacher expectations of pupil performance will decline -- .10 (formerly .55)
9. Leadership styles and organizational climate of schools will improve -- .90 (formerly .41)
10. Teacher behavior with respect to instructional practices will improve-- .90 (formerly .50)

After appropriate changes were made in the conditional probabilities the new matrix was analyzed. The new calibrated probability for an increase in NAEP

reading test scores was .25, an increase from the calibrated probability of .17 on the original computer run. In other words modifying these factors improved the odds of an increase in reading scores from 1 chance in 4.88 up to 1 chance in three.

Events numbered 5, 6, and 7 in the matrix displayed in Table 4 are variables which can be influenced by the school. The next computer run was based on a matrix further modified from the one just described by making changes in the initial probabilities of:

5. Students' self-concepts will decrease -- .20 (formerly .56)

6. Students' attitudes and motivations towards school will decrease -- .20 (formerly .65)

7. Students' sense of control of their own fate will decline -- .20 (formerly .63)

After appropriate changes were made in the conditional probabilities, the matrix was analyzed and the new calibrated probability for event 11 was .36. This time the odds improved further from the original 1 chance in 4.88 to 1 chance in 1.78.

Another variation on the original matrix was tried by changing probabilities assigned to events ordinarily thought of as outside the control of the school. All other events remained as in the original matrix. The following values were assigned in order to present a more optimistic picture:

1. Family expectations, attitudes, and aspirations will decline -- .20 (formerly .64)

2. Peer group expectations, attitudes, and aspirations will decline -- .20 (formerly .54)

3. Percent of children living in poverty will increase -- .20 (formerly .60)

4. Students' ability as measured by I.Q. tests will decrease -- .20 (formerly .61)

When appropriate modifications were made in the conditional probabilities and the resulting matrix was analyzed by the computer, the probability that NAEP reading test results of thirteen year-olds would improve was .25. This probability is the same as the probability which resulted when events directly under school control were optimized. Both increase the odds that NAEP test results will improve from 1 to 4.88 to 1 to 3.

Finally all the probabilities were reset to reflect a situation in which the impact of negative trends outside school control was decreased and the impact of events under the control of or which could be infuenced by the school was optimized. Computer analysis of the resulting matrix yielded a probability of .45 for the indicator, NAEP reading test results for thirteen year-olds -- odds of 1 to 1.22.

Discussion of forecasts

One interpretation of the results of this phase of the study might be that the influence of community factors is so great that schools cannot counteract a poor home and community environment. It is true that our research supports the contention that the community exerts a powerful influence on educational outcomes. At the same time our research supports the importance of the school. More importantly, the study highlights the crucial importance of an effective interaction between the school and the community in relation to educational outcomes.

The interaction between school and community becomes apparent through studying the matrix in Table 4. Through inspection it was found that event number three - percent of children living in poverty will increase - had a greater impact on the other variables than did any other variable. This inspection involved a comparison of the conditional probabilities and the initial probabilities as influenced by event three as compared with other events.

This finding is in agreement with research studies that emphasize the importance of socio-economic status on student achievement. If socio-economic status (in this study represented by the event: percent of children living in poverty) has such an impact on the other variables and thus on educational outcomes, what has an influence on socio-economic status? Socio-economic status is generally defined by the level of income, amount of education and occupation of the head of the household. But what factors influence level of income, amount of education and occupation of an individual? Clearly one of the most important factors is the amount and quality of education of the individual!

Thus there is a mutually dependent and "spiraling relationship" between education and socio-economic status. The extent and quality of an individual's education will affect his socio-economic status which will in turn affect the educational achievement of his children. This will affect the socio-economic status of his children, etc. For 194 years after the founding of this country the spiral was generally up with socio-economic status improving for generation after generation, at the same time that educational achievements improved. The last six years have witnessed a downturn in the spiral with an increasing number of children living in poverty and declining test scores.

Periodic fluctuations in economic progress can be confused with long range trends. If this is another periodic fluctuation the effect will be short lived and limited in scope. If events prove otherwise and a general decline has been reversing previous trends the educational results could be grave.

The findings of this project in no way suggest that the school should take a defeatist attitude. Rather the findings emphasize the necessity for a concerted effort to influence as many variables as possible. Simply changing methods used in teaching or providing new materials will probably not reverse

a general downward spiral. Nor will passing laws on standards, minimum competencies and accountability. If there is one lesson to be learned from this research it is that simplistic answers must be replaced by holistic approaches that involve the community, the home and the school.

One practical demonstration of the value of such an approach is the parent education program developed by Gordon. (Gordon and Breivogel, 1976) This program has demonstrated its potential for influencing a number of the variables identified in this study -- both those in the home and in the school.

One hazard in making forecasts such as those presented in this section is that teachers and parents may assume that little can be done to improve the situation. This leads to the worst kind of self-fulfilling prophecy. Clearly, some methods of teaching are superior to others. Benjamin Bloom has argued that ". . . virtually all children could be taught everything that the schools have to offer so long as the correct methods were sued." (New York Times, June 9, 1976) Dedicated and skilled teachers with appropriate teaching conditions can in fact improve the quality of education. Their efforts will be greatly enhanced through the understanding and cooperation of parents and the community.

SECTION VI

Forecasts with Selected Interventions

Identification of issues

One of the main steps in the forecasting model is the identification of future issues that would require policy decisions that would in turn affect the influencing variables and the social indicators. The identification of these issues was done by the faculty panel in consultation with futurist Dr. Jay S. Mendell from Florida Atlantic University. Mendell played the role of provocateur in helping the panel come to grips with this forecasting problem. His approach was based on the assumption that experts in any field, given sufficient provocation, are likely to find within themselves images of the future which include the important issues that will face policy-makers in their area. These issues were refined in small group sessions in which they were analyzed to bring specific issues more clearly into focus. Larger issues to which these relate were identified, as were more narrow issues which they subsume.

Twenty-five issues were identified by the panel. Some of them were directly related to education while other, broader issues, although not exclusively educational in scope, were seen to have possible implications for education. A perusal of those issues revealed the close interrelation of some of them. Accordingly the issues were revised by these researchers to the following:

1. What provisions should be made for inducting youth into the world of work?
2. How can Florida provide for orderly economic growth?
3. How can the state restore confidence at a time when trust in schools and other institutions is at a low ebb?
4. What is the school's role in solving social problems?

5. Should each community have a board of community education responsible for setting goals, coordinating programs and allocating resources?

6. How shall we meet the challenges of an aging population in Florida?

7. Under conditions of economic stress, how can quality education be maintained?

8. Should the number of years of compulsory schooling be reduced? Should compulsory education be abolished altogether?

9. Should legislative decisions attempt to reverse the trend of a growing disparity between social classes?

10. Should state resources be used to support all educative agencies, not just public schools, colleges and universities?

11. What is the state's responsibility for providing educational opportunities for all citizens and at all levels?

12. What is the role of the schools in the socialization of youth?

13. How should Florida supply industry's labor needs?

14. What is the role of education in assisting citizens to identify and solve "means" problems and "values" problems?

15. How can Florida meet its needs for energy and natural resources?

Having identified these issues, the next step was to select the more salient ones to be used in the forecasting model previously described. The revised list of issues was used as a basis of a Q-sort. The list was sent to each panel member who was asked to sort it in a four-step forced choice procedure to yield the single issue he judged to be the most important in affecting education (see Appendix B). A tabulation of the results was scored using a reciprocal weighting system similar to the one described in Appendix A. The six issues having the highest weighted scores were selected to be used in the forecasting model and were ranked as follows:

1. What is the state's responsibility for providing educational opportunities for all citizens and at all levels?

2. What is the role of education in assisting citizens to identify and solve "means" problems and "values" problems?

3. Under conditions of economic stress, how can quality education be maintained?

4. How can the state restore confidence at a time when trust in schools and other institutions is at a low ebb?

5. How can Florida meet its needs for energy and natural resources?

6. How can Florida provide for orderly economic growth?

Identification of alternative decisions

Once the issues were identified the next step was to identify alternative decisions on each issue. This was done with the assistance of the faculty panel. First, a small group of members of the panel discussed and suggested some alternative decisions for each issue. Then this list was presented to the whole group who discussed and revised it. As a result of this procedure the following alternative decisions were suggested for each of the issues.

I. What is the state's responsibility for providing educational opportunities for all citizens and at all levels?

   A. Strengthen the role of the family in the education of the child.

   B. Establish early child care facilities.

II. What is the role of education in assisting citizens to identify and solve "means" problems and "values" problems?

   A. Design a curriculum which stresses problem solving methodologies dealing with "means" problems and "values" problems and includes opportunities for all ages and groups to explore problems central to their lives and crucial to our society.

   B. Design a curriculum which focuses on cognitive skills and understandings.

III. Under conditions of economic stress, how can quality education be maintained?

   A. Allocate resources based on a continuous assessment of cognitive learning in relation to economic input.

   B. Allocate resources based on a continuous assessment of quantity and quality of education in relation to the needs of an increasingly complex society as measured by cognitive and non-cognitive skills.

IV. How can the state restore confidence at a time when trust in schools and other institutions is at a low ebb?

A. Work out structures and procedures and implement a program which encourages the public to be involved in working out solutions to problems of the educational enterprise at every level of education.

B. Develop a public relations program for the schools.

V. How can Florida meet its needs for energy and natural resources?

A. Develop a series of instructional packages to inform and focus on issues related to Florida's natural resources.

B. Support both basic and applied work of the most knowledgeable scholars in the field of energy.

VI. How can Florida provide for orderly economic growth?

A. Develop a series of instructional packages to inform and focus on issues related to Florida's economic growth.

B. Incorporate in the curriculum a study of the historical consequences of different economic policies and planning.

The alternatives identified are not mutually exclusive. For example, in finding answers to the question, "What is the state's responsibility for providing educational opportunities for all citizens and at all levels?" two alternatives are given:

A. Strengthen the role of the family in the education of the child.

B. Establish early child care facilities.

Both of these strategies could be followed; however, one may be preferable. Responses to this question also illustrate that the alternatives do not cover all possible responses. For example, the alternatives do not address the question of education for various ages of adults.

Estimates of the impacts of alternative policy decisions on the social indicators

After the alternative policy decisions regarding the issues were identified, their impacts on each of the social indicators were estimated. In order to do this, the members of the panel estimated probabilities of the impact of each alternative decision on each event (on the influencing variables and on the indicators). The alternatives suggested for issues V and VI were not judged

to have a significant impact on social indicators. (This is not to imply that these alternatives are not valuable.) Thus, the cross-impact analysis was used only with alternatives in issues I through IV. Since there were eight alternative decisions, eighty-eight estimates were required. Therefore, the panel was divided in two groups, each of which worked on four of the decisions. For the purpose of cross-impact analysis, the alternative decisions were treated and referred to as interventions. The following directions were read to the panel:

> Please estimate the impacts of the interventions on each of the events (variables and indicators). We will use the probabilities for impacts of the variables on the indicators which you assigned at our previous meeting. Each intervention should be considered by itself, not in relation to other interventions.

Each member made his estimations in relation to occurrence of events by 1981 (the time frame used for this forecast) on a tabular sheet similar to Table 4.

The mean probabilistic estimation of the impact of each intervention on each variable and each indicator was used in the cross-impact matrices. Each intervention was used in a separate matrix with one indicator and all the variables. Since there were eight interventions and five indicators, it was necessary to analyze forty matrices.

Table 8 shows the forecast values of the impact of each intervention on each social indicator. The probabilities included are those that were calibrated by the computer after the impact of selected interventions on each of the ten variables was analyzed. In general most of the interventions did increase slightly the probability that the social indicators would change in a positive direction. The interventions that were consistent in this effect were:

1. Strenghten the role of the family in the education of the child.
2. Design a curriculum that stresses problem solving methodologies dealing with "means" problems and "values problems and includes opportunities for all ages and groups to explore problems central to their lives and critical to our society.

Table 8
Forecast Values of the Impact of Different Interventions on the Social Indicators

INTERVENTIONS	INDICATORS				
	NAEP reading scores for 13 year olds will increase	Eighth Grade Test results will increase	The percentage of the labor force that is unskilled will decrease	The total circulation of newspapers in the state of Florida will increase	The percentage of armed forces inductees who fail the mental test upon induction will decrease
Base line values (see Table 7)	.17	.16	.24	.26	.18
Establish early child care facilities	.21	.20	.22	.29	.23
Strengthen the role of the family in the educational process	.24	.27	.35	.43	.29
Design the curriculum to incorporate problem solving processes for means and values issues	.24	.25	.35	.29	.27
Focus the curriculum on the teaching of cognitive skills	.14	.14	.22	.26	.18
Allocate resources for education on the basis of continuous assessment of cognitive learning	.24	.21	.25	.29	.23
Allocate resources for education on the basis of continuous assessment of both cognitive and noncognitive learning	.22	.27	.31	.29	.27
Increase the involvement of the public in every level of the educational system	.22	.28	.29	.29	.25
Increase public confidence in education through an intensive public relations program	.17	.27	.23	.30	.20

3. Allocate resources based on a continuous assessment of cognitive learning in relation to economic input.

4. Allocate resources based on a continuous assessment of quantity and quality of education in relation to the needs of an increasingly complex society as measured by cognitive and non-cognitive skills.

5. Work out structures and procedures and implement a program which encourages the public to be involved in working out solutions to problems of the educational enterprise at every level of education.

Of these interventions that consistently increased the probabilities of an increase in the indicators, the first two produced the largest changes. It seems that these interventions could be effective in improving the educational outcomes. The intervention "Focus the curriculum on cognitive skills and understandings" decreased the probability of three indicators and produced no change in two. It is forecast that this intervention is not effective in improving educational outcomes.

SECTION VII

Summary and Recommendations

Summary

This is the report of a study conducted under a grant from the Board of Regents of the Florida State University System and the Florida Department of Education. The objectives of the study were to identify social indicators of educational outcomes, to forecast the future status of selected social indicators and to make policy recommendations.

Social indicators were defined as a quantitative or qualitative statement that provides information regarding the status of Florida citizens in relation to one or more of the goals of education for Florida. Social indicators were identified by considering measures of: the level of knowledge and skills, the ability to apply knowledge and skills, and the utilization of knowledge and skills. Sixty-three different social indicators were proposed. The following five indicators were selected by the Department of Education to be used in the forecasting process:

1. Percentage of armed forces inductees who fail the mental test upon induction
2. Eighth Grade Test results
3. NAEP Reading Test results for thirteen year-olds
4. Number of newspaper subscriptions per capita
5. Percentage of labor force unskilled.

A model was developed to use in forecasting future values of these indicators. An important component of this model is the identification of variables that may affect the social indicators. In order to identify them a review of research literature was conducted. A faculty panel assisted the researchers in identifying the most important variables through the use of a modified Q-sort. Those identified and used in the study were:

1. Socio-economic status of the family
2. Family expectations, attitudes and aspirations
3. Student's self-concept
4. Peer group characteristics
5. Student's general ability
6. Student's fate control
7. Administrative leadership style
8. Teacher expectations regarding learning ability of specific students or classes
9. Teacher behavior in the classroom
10. Student's attitudes and motivation.

The indicators and the variables were used to construct a series of cross-impact matrices. In the matrices, the indicators and the variables were stated as events to occur in the future. An example of an indicator stated as an event is: the NAEP Reading Test score will increase by 1981. Then, with the assistance of the faculty panel, probabilities of occurrence of each event were assigned. Further, the impacts of events on each other were estimated. Through the use of a computer program, new probabilities were developed for each event. These data were then used as the basis for the generally pessimistic forecast that the values of the five social indicators used in this project would decline by 1981 if present policies and conditions persist.

Recommendations

Three types of recommendations have been developed through this project: (1) recommendations related to forecasts of trends in social indicators, (2) recommendations regarding the goals of education in Florida and (3) recommendations regarding the process of planning for education in Florida. To prepare recommendations related to forecasts of trends

was the specific charge to the researchers. The other two types of recommendations represent, as it were, by-products of the work on this project.

Recommendations related to forecasts of trends in social indicators. Section V of this report presents a forecast that if present trends and policies continue, the values on five social indicators will decline during the period 1976 to 1981. Given this forecast, what policy changes can be made to achieve more desirable futures? In order to answer this question, the faculty panel assisted the researchers in identifying six important issues that will face schools in the future. They also developed alternative responses or interventions, to these issues. (See pages 53,54) The panel then estimated the impact of these interventions on the variables and on the social indicators as described in Section VI.

Table 8 indicates forecasts of the effect of following various alternatives on trends in social indicators. The results are not dramatic and for good reason. First, the forecasts were to cover trends in indicators only until 1981. The impact of many of the alternatives may be minimal in the next five years -- a forecast range of 20 to 25 years may be necessary to encompass the full impact. A second reason that no one intervention provides a large impact is that a number of variables affect educational outcomes. A single intervention, unless it can affect a number of variables, will have a relatively small impact.

Building on the data presented in Sections V and VI, the researchers make the following recommendations:

Recommendation 1. Increase the involvement of the public in every level of the educational system. The faculty panel viewed this as an effective method to restore confidence at a time when trust in schools and other institutions is at a low ebb. Beyond this obvious and important

value, public involvement should foster the type of interinstitutional cooperation that is needed in education. Cremin (1975, p. 7) has argued that in the development of education policy

> ... we must consider the policies with respect to a wide variety of institutions that educate, not only schools and colleges, but libraries, museums, day care centers, radio and television stations, offices, factories, and farms. To be concerned solely with schools, in the kind of educational world we are living in today is to have a kind of fortress mentality in contending with a very fluid and dynamic situation.

Involvement of the public should include a comprehensive look at all the institutions that educate.

Recommendation 2. Strengthen the role of the family in the educational process. This project identified ten variables that affect educational outcomes. A few of these variables are under the control of the schools; many of the more important variables, however, are either under the control of the family or can be influenced by the family. An effective home-school partnership, therefore, holds strong promise for reversing the forecast downward trend of social indicators. This recommendation complements Recommendation No. 1 and represents an important first step in increasing the involvement of the public in education. Gordon, and his colleagues at the Institute for the Development of Human Resources, University of Florida, have developed practical approaches to home-school partnership and have demonstrated its effectiveness. (Gordon and Breivogel, 1976)

Recommendation 3. Design the curriculum to incorporate problem solving processes for means and values issues. Americans are more effective in finding answers to the "how to do it" questions than to the "why we do it -- or should we do it" questions. The schools need to provide more assistance in helping learners achieve the ability to deal effectively with values issues. This recommendation will be elaborated on in the subsequent discussion on goals of education.

Recommendation 4. Allocate resources for education on the basis of continuous assessment of both cognitive and noncognitive learning. There is a tendency to focus attention on the cognitive skills at the expense of the noncognitive skills -- particularly during a period of limited resources. For example, music and art programs are dropped from schools in order to give support to remedial reading programs. Liberal arts education is devalued -- programs are discontinued if they do not lead to immediate employment. Public pronouncements infer, some even state, that the sole reason for a college education is to secure a better job. The above recommendation is not to deny the value and importance of a practical education and of cognitive skills. Rather, it is to argue for the reestablishment of a reasonable balance of emphasis between the cognitive and noncognitive areas.

Recommendation 5. Support both basic and applied work of the most knowledgeable scholars in the field of energy. One of the goals of the State of Florida is "the public education network shall seek solutions to local, regional, state and national problems through organized research and development." (Department of Education, 1975, p. 3) One of the most important state and national problems is energy. The State of Florida has some of the most knowledgeable scholars in the field. Policies need to be adopted to give these scholars full support -- failure to do so may mean that citizens have seriously reduced options regarding energy production and use.

A major issue facing the state is how to provide for orderly economic growth. Although no recommendation is presented on this issue, education has an important role to play. Citizens should have the opportunity to help make decisions related to growth. Not only do they need information

regarding present and future problems associated with economic growth, they also need an understanding of the historical consequences of different economic policies and planning.

Recommendations regarding goals of education. A reconsideration of the goals of education for the State of Florida was not within the scope of this project. However, through the work of the faculty panel the need for a reexamination of the goals became apparent. Social scientists writing on the futures of education provide support for this observation.

As the faculty panel worked on the task of identifying issues that may affect education in the future, they identified a series of symptoms within our society including:

> The alienation of various groups in society
> Civil disobedience
> Recurring crises in the financial community
> Loss of faith in leaders and in one's fellowman
> Loss of faith in institutions -- including government and schools
> Loss of faith in rational processes
> The sense of loss of control over one's life
> The lack of ability of teachers to cope with the mix of social classes in urban schools
> Poverty.

In addition to these symptoms, the panel identified important debates ahead over such issues as energy uses and sources, and the right to privacy. These considerations lead the panel to identify the following as one of the six crucial issues facing education "What is the role of education in assisting citizens to identify and solve "means" problems and "values" problems? Bell indicated the importance of helping students deal with value problems when he wrote

> ... education today inescapably must confront normative questions. This does not mean the schools have to become propagandists; in fact, if they become propagandists they become self-defeating. But there are societal questions underlying all problems of social management that have to be explored. (Bell, 1975, p. 47)

Although the questions of values and means generated the original concern for reexamining the goals, the need extends beyond this. Accordingly, the researchers make the following recommendation:

Recommendation 6. The goals of education for the State of Florida should be reexamined in relation to possible futures. The State Consitiution specifies that the state shall provide education " . . . that the needs of the people may require." (Department of Education, 1975) One way to implement this recommendation would be to examine possible scenarios of the future and from this examination deduce the type of education that citizens will require. Two illustrations will be used to show how this might be done.

Lasswell (1975, p. 2) has predicted that "Global interdependence implies that the future of the U.S.A. will be profoundly conditioned by the world environment, and that the future of our neighbors on this planet will be deeply affected by our development." Rubin (1975, pp. 27, 28) pointed out a series of implications for education based on this and other predictions by Lasswell:

- students must gain access to social facts; the meaning of these facts must be made clear; conceptions of a better world must be deepened; and, above all, social awareness must be translated into social commitment.
- children must acquire repeated practice in judging the probable consequences of societal events; the skills of decision making must be fully exercised; and everything must be done to counteract disillusionment and despair.
- schooling . . . must endeavor to motivate a lasting interest in the common good, a willingness to face hard facts honestly, and a higher threshold for civil sacrifice.

Another illustration is based on the writing of Bell (1975, p. 37) who forecast the emergence of a post-industrial society. " . . . that has gone beyond the production of goods, in which the largest sections of the

labor force are primarily engaged in services." Rubin (1975, p. 55) forecast that for this post-industrial society

> ... education must become more of an end in itself and less of a means to an end. In short, the new reality with which the schools must deal may have less to do with success in the vocational marketplace and more to do with satisfying interpersonal relationships and a meaningful inner life ... Should this be the case, what we will most need is a curriculum that speaks to the sources of the good life.

These illustrations are used to demonstrate the potential value of re-examination goals of education in relation to future scenarios as one means of assuring that the state provides the education that the needs of the people require.

It may be argued that the present goals are broad enough to cover all the points illustrated in the preceeding discussion. If so, some reinterpretation of the goals, or, more precisely, some shifts in emphasis may be called for. This can be illustrated by revisiting Recommendation 3: Design the curriculum to incorporate problem solving processes for means and values issues. As indicated in the discussion of this recommendation, Americans have become very proficient in dealing with the means problems -- the "how-to-do-it" problems -- but are much less effective in dealing with value problems and yet the future of our society will hinge on our ability to deal with the latter.

To what extent do the goals of education for Florida deal with values? The goal given top priority by the Department of Education is basic skills. Note that basic skills are described as fundamental to success. (Department of Education, 1975) The basic skills of communication and computation are in fact necessary for success -- particularly necessary for success in solving the means problems. However, they are not sufficient for solving the values or "ends" problems.

To solve means problems, particularly technological problems, the ability to use language and mathematical symbols is all important. To solve values problems requires not only a different type of problem solving but it also necessitates different ways of knowing. Values problems deal with concepts and emotions associated with truth, compassion, love, hate, morality, etc.. These concepts and emotions are in the affective realm and cannot be learned from dictionary definitions. Rather, they are learned through experience. Through the ages man has learned in the affective realm through experiences in the arts -- poetry, music, drama, dance, drawing, painting, etc. The arts represent one way that children can learn the "basic skills" so important for dealing with the values problems ahead. But the present emphasis on a narrow definition of basic skills -- to prepare students to deal with means problems -- is driving the arts out of our schools. Will future generations be "illiterate" in understanding emotions and thus seriously handicapped when they face value issues?

Other educative forces have taken the place of the school, and to a large extent of the home, in providing children with concepts in the affective realm. Television is a powerful educational force in influencing the development of children's values. Unfortunately, truth comes to be associated with the one-minute commercial comparing the latest washing powder with its nearest competitor -- "It works, it really works!" Compassion is associated with "being chicken," love with casual sexual encounters, hate with beating and maiming someone because "I didn't like his looks" and morality with "what's in it for me." Can society afford to leave the development of "basic skills" in the affective realm to a television industry dominated by the Nielson rating?

The researchers did not attempt to reexamine the goals of education in Florida. The preceeding discussion is presented to suggest the desirability of conducting such a reexamination.

Recommendations regarding the process of planning for education. This project has demonstrated some possible uses of an exploration of the future as a component in a planning process for education. The researchers, with the assistance of the faculty panel and building on the experience of the past year, considered various ways in which studies of the future could contribute to the planning process. As a result the following recommendation is made.

Recommendation 7. A systematic examination of the future should continue to be a basic part of the process for planning in education in Florida. The funding of this project is evidence that personnel in the Strategy Planning and Management Information System Section at the Department of Education are interested in considering the future in their planning process. The intent of this recommendation is to support this interest and to suggest specific ways in which the future may be used in planning for education.

The faculty panel assisted the researchers in developing the following method for utilizing forecasts in identifying future problems and proposing solutions: clarify goals; describe past trends; analyze causal conditions; project future developments; invent, evaluate and select policy alternatives. This method is based on a list of procedures developed by Lasswell (1975, p. 1) which will be briefly described below.

1. Clarify goals. The President of the United States in 2020 is probably in an elementary school today. Are the educational agencies preparing this person for their important role? Are children in today's schools being prepared to cope with the many issues they will be called upon to resolve? It is, of course,

impossible to anticipate all of the problems that will be faced. However, through studying the writings of various futurists it would be possible to prepare summaries that could be used as one basis for periodic reexamination and clarification of the goals of education.

2. Describe past trends. An understanding of past trends can be used in forecasting future events. If time series data regarding educational outcomes can be accumulated, it would be possible to extrapolate future trends. This information could serve as a guide in modifying goals of education and methods used in achieving them.

3. Analyze causal conditions. An examination of past trends should be accompanied by an analysis of the conditions that caused these trends. At the same time, projection of future trends and events should aid the educational planner in anticipating future barriers to effective education and developing strategies to overcome them. Such a projection could lead to research studies that would extend knowledge on causal conditions. The summary of the literature search presented in Section IV of this report provides a good baseline for further analysis of causal conditions.

4. Project future developments. The projection of future developments is central to many of the other steps in the method recommended. A summary of future developments would be of value in clarifying goals. Similarly, such a summary would be important in projecting past trends into the future, in analyzing causal conditions and in recommending policy decisions. The importance of the step of projecting future developments demonstrates the interactive nature of the five procedures.

5. Invent, evaluate and select policy alternatives. As a result of the four procedures outlined above, it would be possible to invent, evaluate, and select policy procedures. The evaluation would be of two types. First, through a simulation or a pilot study it would be possible to estimate the consequences of an alternative. Second, once the policy alternative has been instituted, its impact would be monitored.

A very important consideration in the use of the five procedures outlined above is who should participate in the various activities. Since decisions resulting from these activities will be among the most important for our society, the question of participation needs to be addressed by considering the following questions:

1. Given the right of people to decide their own destiny, in what ways should the public be involved?
2. Given that implementation of a policy requires involvement in decision making, in what ways should professional educators be involved?
3. Given that specialized technical capabilities are required for generating some types of data, what are the roles for the specialist?

These questions should not be answered in isolation. In fact, the most effective planning for the future will result from a coordinated effort of the public, the professional and the researcher. The researchers who had the opportunity to work on this project hope that the data generated, as well as the procedures developed, will contribute to such coordinated planning for education.

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Appendix A

Selection of Variables Through Modified Q-Sort Technique

The modified Q-sort technique used the instrument reproduced below. The number in each cell represents the number of choices made. The weighted total was computed by weighting tallies in each column using a factor equal to the reciprocal of the probability that any item would be checked in given column. Since ten items were selected out of fourteen possibilities in column 1, the probability of the selection of any one item is 10 out of 14. The reciprocal weighting factor is, therefore, 14/10 or 1.4. Similar weighting factors were computed for columns 2, 3 and 4 to be 2.33, 4.67 and 14. The weighted total is a summation across the row.

Possible Variables	Out of 14 Select 10 Most Imp. Variable	Out of 10 Select 6 Most Imp. Variable	Out of 6 Select 3 Most Imp. Variable	Out of 3 Select 1 Most Imp. Variable	Weighted Total
Family expectations, attitudes & aspirations	12	10	6	3	110
Peer-group characteristics	12	11	4	1	75
Socio-economic status	11	10	5	4	118
Student's general ability	9	8	6	1	73
Student's self concepts	9	5	3	3	80
Student's attitude and motivation	9	4	4		41
Student's fate control	10	5	2	1	49
Teacher expectations	10	7	3		44
Teacher experience	5	1			9
Teacher behavior in classroom	11	6	3		43
Teacher training	5	1			9
Teacher academic standards	6	1			11
Normative system of the school	10	4	1		28
Administrative leadership	9	5	2	1	48

Appendix B

Selection of Issues Affecting Education

		Out of 15 Select 11 Most Imp.	Out of 11 Select 7	Out of 7 Select 3	Out of 3 Select 1	Weighted Scores
1.	What provisions should be made for inducting youth into the world of work?	8	5	3		37
2.	How can Florida provide for orderly economic growth?	8	6	4		44
3.	How can the state restore confidence at a time when trust in schools and other institutions is at a low ebb?	10	6	4	1	62
4.	What is the school's role in solving social problems?	8	5	1	1	42
5.	Should each community have a board of community education responsible for setting goals, coordinating programs and allocating resources?	3	1			6
6.	How shall we meet the challenges of an aging population in Florida?	10	8	2		41
7.	If current economic trends continue, how can schools maintain current standards with less money?	9	4	3	2	66
8.	Should the number of years of compulsory schooling be reduced? Should compulsory education be abolished altogether?	8	3			17
9.	Should legislative decisions attempt to reverse the trend of a growing disparity between social classes?	8	3	2	1	42
10.	Should state resources be used to support all educative agencies, not just public schools, colleges, and universities?	3	2			8
11.	What is the state's responsibility for providing educational opportunities for all citizens and at all levels?	11	11	6	4	129
12.	What is the role of the schools in the socialization of youth?	10	4	2		33
13.	How should Florida supply industry's labor needs?	6	3			14
14.	What is the role of education in assisting citizens to identify and solve "means" problems and "values" problems?	9	7	3	2	72
15.	How can Florida meet its needs for energy and natural resources?	10	9	3		48