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Theoretical considerations for the development of social indicators: the education sector

Saundra MacDonald Hunter

Iowa State University

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Theoretical considerations for the development of social indicators: The education sector

by

Saundra MacDonald Hunter

An Abstract of
A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of DOCTOR OF PHILOSOPHY

Approved:

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For the Graduate College

Iowa State University
Ames, Iowa
1975
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CHAPTER 1: INTRODUCTION

Social Theory and Social Indicators

"Social indicators," "social reports," and "social accounts" are three terms which increasingly are used in connection with attempts to develop a comprehensive but empirical approach for describing, understanding, and managing society (Bauer, 1966).

An interest in developing a social accounting system is not new. It seems, as long as people lived in groups, they were concerned with simple questions, such as: how many were in the group? As societies develop, however, questions become more complex than simple enumeration. The increasing complexity of economic and social institutions in developed and developing countries has brought a rapid growth in the demand for statistics as a factual basis for decision-making in most fields of human activity. In developing economies, particularly, seeking a sound basis for development plans, statistics have come to be an essential tool. While economic indicators have been developed and used extensively to monitor societal growth, only a small fraction of the existing statistics tell us anything about social conditions, and those that do often point in different directions. Most often, they do not add up to any meaningful conclusion and thus are not very useful to either the policymaker or the concerned citizen.
(Gitter and Peterson, 1970:20). This haphazard manner of gathering social statistics only points to the fact that there are shortages in social theory which would provide guidelines for the collection of relevant indicators.

If social indicators are to be developed in such a manner as to be meaningful and helpful to policymakers and the concerned citizen, a general theory would help clarify the goals and the means to those goals of societies. However, social scientists must admit that:

an operationally meaningful theory, consisting of all the human activities under the relevant ecological constraints connected with the human decision-making, does not exist (Hjerppe, 1973:34).

Thus the social scientist has only limited tools with which to consider the overall state of the society, nor does a government agency have any such tools for planning programs and allocating resources.

In view of this lack of sociological theory which would explain much of human activity in terms of overall society and thereby offer guidelines for policymakers, this study proposes to pursue a "theory of the middle range": a theory which lies between the minor but necessary working hypotheses that evolve in abundance during day-to-day research and the all-inclusive systematic efforts to develop a unified theory that will explain all the observed uniformities of social behavior, social organization and social change (Merton, 1957:39).
It is possible to perceive that questions concerning problems confronting a policy-maker are essentially questions about different aspects of the same kind of sociological phenomena. When this is perceived, it then becomes possible to make use of existing theory and research findings, research technology, and generalizations that have been gradually developed over the years.

This study attempts to relate some of the objectives of social indicators to sociological distinctions and theory. There are political and practical reasons for attempting to select indicators on the basis of a theoretically grounded frame of reference: (1) it may be misleading to establish a profile of development on the basis of existing statistical data. Vested interests may be at work in the production of statistics or in neglecting to produce certain kinds of statistics; (2) the application of a theoretical scheme permits economy in selecting indicators (Allardt, 1973b:260).

The Significance of Education as a Problem in Developing Countries

International work on social indicators per se began in the late 1960's, stimulated by the increased national and international concerns about the conditions and the quality of life, as well as the distribution of the fruits of economic growth. This work is being carried on by world and regional
Intergovernmental bodies, such as members of the United Nations family, the Council of Europe, the Council for Mutual Economic Assistance and Organization for Economic Cooperation and Development, by nonprofit bodies, such as the Social Science Research Councils of the Nordic Countries, of the United Kingdom and the United States, the Institute for Social Research, University of Michigan, Social Indicators for Developing Countries, Iowa State University and by various individual scholars (United Nations Economic and Social Council, 1974a). Nearly all of this research on social indicators begins with the listing of social concerns or societal goals. Education is always found on such a list. Education has come to be considered one of the most essential factors which influences economic growth and as an allocation technique connected with social stratification (Olkinuora, 1973). Thus, education is viewed as a factor which contributes to the "quality of life" at both the individual and societal level.

Third World educational problems stem from a historic conjunction of the following factors: an increase in the number of pupils, an acute scarcity of resources, rising costs and the inability of the educational system to adapt to a changing environment which results in inertia and ineffectiveness.
Increase in the number of pupils

The increase in the number of pupils in the Third World who attend schools comes from three sources. First, an increase in life-expectancy, brought about through improved health care, has resulted in a population explosion at the school age level. Second, education is regarded as the primary instrument in social mobility. The parents see schooling as the kind of academic education their European rulers had no matter how unfitted it might be to life in the village. This type of education gave the European his material superiority and offers the local boy a hope of release from the poverty of life on the land (Beeby, 1966). Third, university degrees and diplomas often take on the value of substitutes for titles and privileges (United Nations Educational, Scientific, and Cultural Organization, 1972:31).

Inequality of educational opportunities

Rapid change in society may result in educational inequalities with those who are highly educated vs those poorly educated. This is often characterized by flagrant inequality in the geographical and social distribution of available educational resources (UNESCO, 1972). Education policies have always favored urban middle and upper income groups. Equal access to educational opportunities are necessary and may only be achieved by such methods as "quota systems" or improvements in the methods of educational finance. Nonetheless, equity in
educational opportunities can only be achieved through broad social policies (World Bank, 1974).

**High costs and scarcity of resources**

The high costs of education in countries with a scarcity of resources has resulted in the need for some sort of priority setting in educational goals and an information system which would provide feedback concerning the attainment of such goals. In developing countries, a consistently wrong approach to education would be wasteful and costly. Efficiency in educational systems is often lost because educational objectives and performance standards are not well specified. With limited resources, it is important that educational systems specify their quantitative and qualitative goals. A wide approach to planning is needed in order to eliminate waste and reduce costs. Inefficiencies are reflected in high drop-out rates, high repeater rates, in two ways: internal efficiency is characterized by less than optimal use of teachers and buildings (Levy, 1971). External efficiency is related to a large number of "educated unemployed" on the one hand, with critical shortages of skills on the other. Internal and external efficiency "concerns the most profitable utilization of resources in proportion to results, and, inversely, the best possible results in proportion to utilization and demand (relevance)" (Helsinki, 1973:46).
Educational conservatism

For, just as the beliefs and values of a society determine the kind of educational system it chooses to set up, so does the educational system affect what beliefs and values are either perpetuated or changed (Harman, 1970:360).

"These discrepancies between the supply of, and the demand for, skills are caused by a complex set of social, cultural and political conditions and aspirations which condition the development of educational systems" (World Bank, 1974:20).

The greatest educational problem facing the Third World, as seen by this study, is the inability of the educational system to adapt to a changing environment. While education can be seen as an important instrument of change and development on one hand, it can also be seen as the preservation of the status quo and tradition on the other. The realization that education in developing countries is conservative is not new, economists have long noted that conservatism of educators and educational systems is one of the barriers to both educational and economic progress (Coombs, 1968; Benson, 1961).

Adam Curle has noted:

...in most societies for most of recorded time, education has been a reactionary force rather than a progressive one. Education, often closely associated with religion, has tended rather to hallow antiquity than to promote innovation (Curle, 1964:33).

Thus, when one speaks of modernization it is important to distinguish the difference between the modernization of education and the modernization of society. Modernizing of
society is usually characterized by a break from tradition, the application of science and technology to meet increasing needs and desires, the attainment of high standards of living, the accumulations of capital and wealth, the spread of material comfort and the prevalence of reason and enlightenment among the masses (Kirpal, 1971:138). Modernization of education is a different matter. Education, for the most part, remains traditional all over the world, changing slowly and responding inadequately to rapid change in the life of man and society.

Recent literature, however, has suggested that education should increase adaptability to change (Clark, 1962; Gardner, 1963; Harvey, 1961; Fullan and Loubser, 1972). By its nature and rapidity, social and technological change has in impact on styles of life and the environment and particularly upon highly traditional environments such as those found in Latin America, the middle-East Asia, and Africa. These factors call into question the assumption that schools exist to maintain the status quo which educates children into a more or less static culture and equips them for life with a standard set of knowledge and skills. As a result, this static, conservative education does not train individuals for situations in which novel solutions will have to be sought.

At its best...it produces a trained rigidity from which only a few escape into genuine creativeness; and at its worst it increases the alienation from society of very large proportions of children and adolescents who are ill-prepared for and even antagonistic
to that lifelong education and professional retraining which rapid social and technological change is thought to demand (International Bureau of Education, 1975:31).

Levy (1971) suggests that a high drop-out rate in developing countries may be a result of school systems which are irrelevant for the mass of the people and geared completely to the maintenance of the status-quo.

Kirpal (1971) sees training for adaptation as the crisis facing education today and identifies the quest for the quality of life as the essence of modern education.

The quest for the quality of life which is the essence of modern education offers new hope and opportunity to poor and materially deprived societies. With the right type of education a developing society can attain satisfaction, harmony and comprehension that may elude more prosperous community.... The quality of education lies at the heart of educational change, for only a good education can both serve as an effective instrument of economic and social development and enrich the quality of life by integrating society and giving scope and freedom to the individual (Kirpal, 1971:139-140).

What, then, are the essential characteristics which would reflect this "qualitative" aspect of education? Selected literature from the developing areas suggests that quality in education:

1. must be related closely and meaningfully to the life, needs, and aspirations of individuals living in a changing society (Kirpal, 1971; Beeby, 1966; Freire, 1970).

3. Should change its emphasis from acquired knowledge to the ability to think or the development of a "critical consciousness" (Friede, 1970) which stresses problem solving, and flexibility in thought and in learning strategies (International Bureau of Education, 1975).

If it is true that sheer reluctance to change in the educational system threatens the quality of education and thereby the quality of life of some emergent countries, the problem becomes an analysis of "why." Are there structural aspects of the school system which encourage or discourage flexibility in thought and learning strategies of schools and individuals? The sociological question then becomes: What are the structural aspects of the educational system which determine the quality of education?

Educational Quality and Social Indicators: Specific Objectives

This study attempts to relate some of the objectives of social indicators to sociological distinctions and theory. Social indicator objectives are twofold: to provide a theoretical context from which the contents of specific social indicators follow and to provide direction for the assessment of social change (Land, 1972).

Prospects for improving the educational information system so that it will be usable by the policymaker to assess the quality of education depends largely upon the ability to incorporate and utilize sociological theory and research aimed at the development of a more adequate knowledge of
Adequate knowledge of the educational system must include an analysis of the relevant social process related to the problem as well as a description of outcomes. Land (1972) has identified three types of social indicators, each designed for different uses:

1. Output descriptive indicators are measures of the end products of social processes and are most directly related to the appraisal of social problems and social policy.

2. Other descriptive indicators which are more general measures of the social conditions of human existence and the changes taking place therein.

3. Analytic indicators which are components of explicit conceptual models of the social processes which result in the values of the output indicators.

Finally, Sheldon and Land (1972:139) specify that these indicators must be capable of collection in a time-series form either in an aggregated or disaggregated manner to whatever level appropriate for a particular analysis.

From this research problem, the following objectives will be pursued:

1. to inductively and deductively identify goal areas of the educational system.

2. to develop output descriptive indicators.

3. to identify a relevant theoretical model which specifies several goal areas and the structural means to
achieve them.

4. to develop and test a social indicator model which contains both output descriptive indicators and analytic indicators (Land, 1972).

5. to evaluate the model in terms of its contribution to social indicator construction and analysis as well as its utility for policy formation.
CHAPTER 2: THEORY

Introduction

The four objectives of this chapter are: (1) to deductively and inductively identify goal areas of the educational system; (2) to develop output descriptive indicators; (3) to identify a relevant theoretical model which specifies several goal areas and the structural means to achieve them; (4) to develop a social indicator model which contains both output descriptive indicators and analytic indicators.

Deductive Approach to Goal Selection

Definitions of complex organizations

Organizations are social systems. A social system is defined as a set of variables that are interrelated so that a change in one variable results in or is associated with a change in another variable.... We call this social system because each of the variables represents an abstract dimension of interactions among people (Hage and Aiken, 1970:64).

Organizations (1) are networks of social relations and shared orientations which have been deliberately established for a certain purpose (Blau and Scott, 1962:4).

(2) are "social units (or human groupings) deliberately constructed and reconstructed to seek specific goals" (Etzioni, 1964:3).
(3) are collectivities "with relatively identifiable boundary, a normative order, authority ranks, communications systems, and membership coordinating systems; this collectivity exists on a relatively continuous basis in an environment and engages in activities that are usually related to a goal or a set of goals" (Hall, 1972:9).

Characteristics of organizations

Black (1961:214-215) has identified three characteristics of formal organizations.

1. "...Formal organizations contain subunits (individuals, departments and functions, occupational groups), and organizations can in turn be thought of as subunits of larger systems (such as the educational system or the economy)."

2. "...activities in formal organizations are clearly "motivated," i.e. oriented toward the achievement of some goal."

3. "...organizations, more than other kinds of aggregates, have explicit mechanisms for solving the twin problems of how to maintain their identity vis-a-vis. Their environment, maintaining whatever patterns of internal relationships they have established, while at the same time obtaining from the environment the support they need for survival."
Parsonian goal approach

Most of the research related to complex organizations investigates the organizations effectiveness in achieving its goals. (For a complete discussion of types of goal approaches, see Evers, 1973; for a discussion of the evolution of the goal approach, see Georgiou, 1973).

Whatever else authors have to say on the general subject, there seems general agreement... that it is the dominating presence of a goal that marks an 'organization' from all other kinds of systems (Gross, 1969:227).

One of the leading goal approaches to organizational analysis is that of Parsons (1960b). According to Parsons, each system and subsystem in a complex organization has the same types of problems or goals to solve in order to continue as effective, functioning units in society. Every system and subsystem must establish a purpose for being (goal attainment), determine what means to use for survival in the environment (adaptation), establish a means of coordinating its efforts (integration), and solve the above three problems with the minimum of strain and tension (pattern maintenance) (Lyden, 1975:60). See Figure 1.

<table>
<thead>
<tr>
<th>A</th>
<th>ADAPTATION</th>
<th>G</th>
<th>GOAL ATTAINMENT</th>
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<tr>
<td>L</td>
<td>LATENCY</td>
<td>I</td>
<td>INTEGRATION</td>
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Figure 1. Four Parsonian functional problems of any system or subsystem
Parsons suggests that maximizing efforts to resolve one problem intensifies one of the other problems.

Resolving adaptation problems increases problems of integration (and vice versa); goal attainment intensifies the problem of general pattern maintenance; and there is a more general antagonism between the resolution of A and G (task or instrumental) problems (social-emotional or expressive) on the other (Black, 1961:219).

Blau and Scott (1962) refer to this as the organizational dilemma while Parsons, Bales and Shils (1958) refer to this as functional strains. Economists have long discussed interdependence in the economic system and have noted that changes in one part of that system has an effect on another part of that system. In this discussion of schools as formal organizations, changes occurring in them are treated in an analogous manner. In this way, some predictions regarding organizational effectiveness in achieving educational goals may be assessed as well as the identification of relevant analytic and descriptive indicators from which implications may be drawn for school policy.

Inductive Approach to Goal Selection

Social concerns of educational policy

Educational goals can be gleaned from areas which countries show continuing interests. These areas can be derived from statements made by various international agencies conducting research in the development of social indicators
(or related concepts). Once goal areas are articulated, then one can monitor performance toward these goals with the identification and collection of relevant information.

Table 1 identifies the educational goal areas articulated by SSDS, OECD, and the World Bank.

These goal areas can be summarized into the Four Parsonian Functional problems facing any social system: Goal Attainment, Integration, Latency (Tension Management or Pattern Maintenance), and Adaptation.

Definitions of goal concepts

**Goal attainment (productivity)**  
Productivity is defined as acquired skills and knowledge. In an educational information system, it is essential to have some information about the present educational productivity of the population (stock) if only to provide baseline information to which one would monitor change. Productivity of a society can be measured directly by scores on achievement tests or indirectly by enumerating the number of graduates by level and type. Coleman (1966) found that differences in family background accounted for more variations in achievement scores than do differences in school facilities. His findings have been criticized; most recently by Bidwell and Kasarda, 1975. They found that the structure of school districts did make a difference in individual achievement.
Table 1. Socio-educational concerns of SSDS, OECD, and the World Bank

<table>
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<tr>
<th>SSDS subjects of socio-educational concerns</th>
<th>OECD list of socio-educational concerns</th>
<th>World Bank issues of socio-educational concerns</th>
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<td>A. Educational attainments of the population</td>
<td>The acquisition by children of the basic knowledge, skills and values necessary for their individual development and their successful functioning in society.</td>
<td>There should be at least a minimum basic education for all, as fully and as soon as available resources permit.</td>
</tr>
<tr>
<td>B. Use and distribution of educational services</td>
<td>The availability of opportunities for continuing self-development and the propensity of individuals to use the.</td>
<td>In the interest of both increased productivity and social equity, educational opportunities should be equalized as fully as possible.</td>
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The maintenance and development by individuals of the knowledge, skills and flexibility required to fulfill their economic potential and to enable them to integrate themselves in the economic process if they wish to do so. Further education and training beyond the basic level should be provided selectively to improve both quantitatively and qualitatively, the knowledge and skills necessary for the performance of economic, social, and other developmental roles.
### C. Educational achievement and efficiency of educational services

No counterpart in the OECD list

A national education system should be viewed as a comprehensive system of learning, embracing formal, nonformal, and informal education, all working with maximum possible internal and external efficiency.

### D. No counterparts in the SSDS

The individual's satisfaction with the process of individual development through learning while he/she is in the process.

Maintenance and development of the cultural heritage relative to its positive contribution to the well-being of the members of various social groups.

---


Integration is composed of two related concepts: equity (Lyden, 1975), and internal efficiency (Hage, 1965).

1. Equity - Equity is defined as equality in access, use, and distribution of educational services.
   a. Trends in the extent to which the various categories of the population who may be expected to attend full-time or part-time education.
   b. Information on individuals attending school and on the corresponding total population, classified by age, sex, rural, urban, national or ethnic origin.
   c. Per capita total consumption expenditure on education.
   d. The volume of educational services used in urban and rural areas.
   e. Enrollment in full-time and part-time education according to level of education and area of study.

2. Efficiency - Efficiency can be defined in at least two ways, one more complex than the other. Efficiency can be concerned with the most profitable utilization of resources in proportion to results, and inversely, the best possible results in proportion to utilization and demand (Helsinki, 1973:29). It can also be conceptualized in a more simpler manner: cost per pupil (Coombs and Hallak, 1972).
a. An analysis of the internal efficiency of the various levels and branches of the educational system involves a cohort analysis of entrants into the system, dropout rates, repeating and promotion, by grade, type of study and year of study. In this manner inputs (the number of entrants) can be related to outputs (the number of school leavers or graduates). Identification of related factors, such as number and type of teachers, buildings, and equipment are also necessary in order to have a complete and intricate analysis of the internal efficiency of education. A cohort analysis facilitates a more complete understanding of one of the major problems of education in developing countries—that of "wastage."

Latency (school satisfaction)   School wastage in developing countries has also been thought to be caused by boredom in schools employing the methods of dull and meaningless memorization. In Columbia in the middle 1960s less than one quarter of entrants into secondary education completed six years, and under half of students in higher education completed their courses. In organizational literature, job satisfaction is usually measured by attitude items and the amount of turnover. For this study, "satisfaction is the
degree to which the members of a social system have a positive affective orientation toward membership in the system" (Price, 1971:156).

Satisfaction of the students with the educational services is a subjective approach which can supplement those indicators based on a more objective approach. From the point of view of Andrews (1973; Andrews and Withey, 1974) perceptions and attitudes yield more relevant or reliable data about aspects of the "quality of life" than social indicators of a more objective type. Subjective indicators, however, suffer from serious conceptual and practical difficulties of defining and gathering such data.

Adaptation (educational quality) The fourth goal area to be considered is in terms of the quality of education required by the present and future needs of the individual and society.

This problem is related to the rational and efficient utilization of educated manpower, particularly high level manpower. There are several kinds of malutilization of qualified manpower in developing countries:

1. Unemployment
2. Brain-drain
3. Highly qualified people who occupy jobs for which lower qualifications are required.
This problem is sometimes referred to as external efficiency. Most analysis of external efficiency tries to establish a direct link between supply and demand projection. Thus, one type of analysis of the external efficiency of the educational system can be referred to as the "supply projection." This method shows the number of people, by level and type of education, available for entry into the labor force (if there is no substantial change in the educational policy and if individual demand remains proportionately the same as in the past). An analysis of educational demand (social objective) would link the type of new entrants (such as social origin, intelligence, school record) with various branches of second level or third level education. Information required to identify the economic objectives of a society (demand projection) would require data on the occupational structure of the labor force by sector of economic activity and on the educational profile of occupations. Whereas, the "supply projection" starts with the number of new entrants into the educational system and ends with the number of school leavers, graduates and dropouts potentially available for entry into the labor force; the "demand projection" starts with the future needs for skilled personnel of the various sectors of the economy and ends with the calculation of the number of school leavers, graduates, etc., that will be required.
One of the major criticisms of complex organization research (Hirsch, 1975) is that organizations are studied as if they were closed systems.

In short, while we speak of organizations as interacting with their environment (in theory), most empirical studies, by virtue of their design, continue to ignore the process by which this interaction occurs, from both the standpoint of the focal organization and that of agencies in its environment (Hirsch, 1975:3).

Perrow (1972:199) has also commented along these lines:

Among the many reasons...for the failure to go beyond trivial organizations, we should also include the most significant failure of all of organizational theory: the failure to see society as adaptive to organization. Parts of the 'environment' are seen as affecting organization, but the organization is not seen as defining, creating, and shaping its environment.

A constantly changing technology requires a regular qualitative adaptation of the educational system. On the other hand, however, education has importance in defining, creating, and shaping its environment through its potential impact on value formation, the transformation of the political structure, and improved development of human potential (Ginzberg, 1974; Freire, 1970; Clark, 1962; Gardner, 1963).

In his essay The Child and the Curriculum, John Dewey wrote that schools can given rise to an artificial conflict. "We get the case of the child vs. the curriculum; of the individual nature vs. social culture. Below all other divisions in pedagogic opinion lies this opposition" (Dewey, 1963:..."
The division and specialization of subject matter in the curriculum, he argued, are alien to the nature of the child.

Again, the child's life is an integral, a total one. He passes quickly and readily from one topic to another, as from one spot to another, but is not conscious of transition or break. There is no conscious isolation, hardly conscious distinction. The things that occupy him are held together by the unity of the personal and social interests which his life carries along.... (His) universe is fluid and fluent; its contents dissolve and re-form with amazing rapidity. But after all, it is the child's own world. It has the unity and completeness of his own life (pp. 5-6).

In contrast to the wholeness of the child's perceptions and experiences, "he goes to school, and various studies divide and fractionalize the world for him" (p. 6). Dewey argued that "the only significant method is the method of the mind as it reaches out and assimilates.... It is because of this (specialization) that 'study' has become a synonym for what is irksome, and a lesson identical with a task" (p. 9).

Beeby (1966) identifies "meaning" as a major goal dimension of his stage theory of educational development in developing countries. And, indeed, he punctuates its importance by labeling the final stage of educational development as the Stage of Meaning. At the lower end of the continuum is the Dame Stage which is characterized by "the slow accumulation of almost meaningless symbols [which] clogs the mind and seals it off against formal schooling, however lively it may remain in the real world outside the school"
...at the dame school stage, the connection between symbol and meaning is often lost entirely.... Classroom facts and skills are thin disparate things that mesh poorly with one another and hardly at all with the warm, rich world of the child's personal life" (p. 61). Finally, at the stage of meaning "as its name implies, is that meaning and understanding play an increasing part in the pupil's day..." (p. 67).

Adaptation then, refers to the degree to which activities in the school are interrelated together into a whole whereby cognitive development occurs as part of the process of a problem oriented search for knowledge and understanding about the real world rather than through departmentalized divisions of knowledge about that world. Beeby provides an example:

I recall seeing a lesson on a fish given on a remote Pacific island. The teacher had copied from a book on to the blackboard a beautifully executed drawing of a fish, but, unfortunately, had managed to draw the scales back to front. This did not deter her from giving, with constant reference to the drawing, the prescribed portion of the lesson on the function of the scales. Although fish formed an important part of the islanders' diet, and the teacher and every child in the room had caught or cooked them for most of their lives, it did not occur to anyone to comment on the difference between the fish on the blackboard and the fish in the lagoon (Beeby, pp. 61-62).

The concept of adaptation can also be seen in the work of Freire (1970). Freire sees the development of a "critical consciousness" when the teacher uses the problem-posing method of education instead of the "Banking" method (which is
characteristically conservative);

Banking education...attempts, by mythicizing reality, to cancel certain facts which explain the way men exist in the world; problem-posing education sets itself the task of demythologizing. Banking education resists dialogue; problem-posing education regards dialogue as indispensable to the act of cognition which unveils reality. Banking education treats students as objects of assistance; problem posing education makes them critical thinkers. Banking education inhibits creativity and domesticates (although it cannot completely destroy) the intentionality of consciousness by isolating consciousness from the world, thereby denying men their ontological and historical vocation of becoming more fully human. Problem-posing education bases itself on creativity and stimulates true reflection and action upon reality, thereby responding to the vocation of men as beings who are authentic only when engaged in inquiry and creative transformation (Freire, 1970:71).

Fullan and Loubser (1972) have also related education's contribution to individual and social system "adaptive capacity." Through the development of this "adaptive capacity" or "critical consciousness" the individual will learn "to perceive social, political, and economic contradictions, and to take action against the oppressive elements of reality (Freire, 1970:19). For Parsons, adaptation is the survival problem of securing from the environment sufficient facilities and then distributing these facilities throughout the system (Turner; 1974:39). The development of quality in education ("adaptive capacity" or "critical consciousness") will enable individuals to perceive and act in order to eliminate inequalities in facility distribution which are
often the consequence of a rapidly changing society. In this manner, the products of the educational system can influence the environment in a qualitative way. In this study the concept of "qualitative education" is defined as the training of adaptive capacity which is "the ability of an organism or a social system to cope with a wide range of environmental conditions" (Fullan and Loubser, 1972:272). For a complete social indicator account, data requirements would include an analysis of curricula and teaching methods, type of education available (technical or professional), the relevance of the education received to a changing society, and an estimate of potential adaptability of the individual. (For a summary of these goal indicators see Table 2.)

Development of Output Descriptive Indicators

Thus, the development of output descriptive indicators has been accomplished through a theoretically grounded approach. These are Goal Attainment (productivity), Integration, Latency, and Adaptation and are believed to be summary concepts derived from concerns societies continually express as indicated by the work of SSDS, OECD, and the World Bank, and translated here into the Parsonian Scheme. Even though the objectives of education can be stated in diverse ways, there seems to be certain common core areas. Table 2 provides a summary of these goal areas.
Table 2. Schematic outline of the frame of reference for educational indicators

<table>
<thead>
<tr>
<th>Integration</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>The regional equality of the distribution of student places.</td>
<td>Organization and Resources of teaching.</td>
</tr>
<tr>
<td>Selection for existing student places according to social status, region and sex.</td>
<td></td>
</tr>
<tr>
<td>Representativeness of value and attitude contents from the point of view of subcultures of social classes.</td>
<td></td>
</tr>
<tr>
<td>Financial costs per new student place according to field and level of education.</td>
<td></td>
</tr>
<tr>
<td>The proportion of those having received goal-level education of the entire population. Costs per stock or its part.</td>
<td>Level of skill and knowledge acquired.</td>
</tr>
<tr>
<td>The regional, social and male-female equality in the distribution of schooling in the entire population.</td>
<td></td>
</tr>
<tr>
<td>Measures toward equalization of differences in achievement and motivation.</td>
<td></td>
</tr>
</tbody>
</table>

*aAdapted from Olkinuora, 1973.*

*bIndicators in this study.*
Adaptation | Latency
---|---
The relevance of the distribution of student places with regard to production. | Fairness of treatment and making.
The correspondence between the distribution of education of those annually entering employment and the manpower needs of production. | Possibility to choose the kind of further education one is interested in after compulsory education.
Relevance of teaching contents from the point of view of the needs of production and of scientific technological development. | Relevance of teaching contents and methods from the point of view of the individual's development and resources (e.g., promoting creativity, activeness, critical attitude).
Relevance of actually produced knowledge and skill stocks from the point of view of production and working life. | Satisfaction with the school environment.
The adequacy of the educational stock of the entire population from the point of view of production needs. | The proportions of those in different groups of the population who have received the education they would have wanted.
Hausser (1973:276) has suggested that models which are to be utilized for decision purposes obviously require either explicitly or implicitly a criterion function for policy makers... while models constructed strictly for prediction purposes do not require such information (Hausser, 1973:276).

For this study, a model will be presented for prediction purposes based on goal preferences stated theoretically (Parsons) and empirically (World Bank, SSDS, OECD). The primary concern is to specify relevant factors which influence (perhaps causally) the attainment of such goals. The next immediate step here is to identify such hypothesized relevant factors.

Styles of Organizational Structure: The Development of a Social Indicator Model

The complex organizations literature becomes directly relevant to education in developing countries when one asks what kind of organization leads to goal attainment, integration, latency, and adaptability. Developing countries are concerned with the optimum use of resources (Coombs and Hallak, 1972), reduction of drop-out rates (Levy, 1971), and the ability of schools to prepare children to lead meaningful, self-directed lives in a constantly changing society (Beeby, 1966; Bereday, 1969; Bernstein, 1967; Blum, 1972; Boyle, 1969; Cohn, 1967; Coombs, 1968; Cunningham, 1969; Curle, 1962). From an organizational perspective "the basic
problem is...: How is it possible to create an organization in which the individuals may obtain optimum expression and, simultaneously, in which the organization itself may obtain optimum satisfaction of its demands" (Argyris, 1965:182). Studies of organizations have found that variations in organizational structure do make a difference and organizations as social systems have internal tendencies toward one of two organizational styles (Hage and Aiken, 1970). Organizations which optimize individual expression and innovation are generally characterized by dispersion of power such that members participate in organizational decision-making [low centralization] and experience a relatively high degree of freedom and autonomy; social interaction is not highly formalized, there is little standardization of performance criteria [low formalization]; diversity is encouraged [high diversification]; and, task specialization is low while person specialization is relatively high [high complexity] (Thompson, 1967; Burns and Stalker, 1961; Wilson, 1966; Hage and Aiken, 1970; Argyris, 1965). From these findings, two models of organizations have emerged. Burns and Stalker (1961) discuss the "organic" and "mechanical" models of formal organization, while Hage and Aiken (1970) the "dynamic" and "static." Structurally, the organic or dynamic model is characterized by high complexity, low centralization, low formalization, and high diversification; the mechanical or
static models are ideal—typically at the other end of these continua. One finds as a consequence to these structural characteristics that members of the organic or dynamic organizations are more creative and innovative, have higher morale, express a higher level of satisfaction, and are less alienated in their jobs (Hage and Aiken, 1970; Argyris, 1965). Furthermore, Burns and Stalker (1961) found that organizations with relatively organic structure were more adaptive and innovative in changing the environment than mechanistic organizations.

Beeby (1966) has noted a similar phenomena with regards to education in developing countries. His theory of Educational Stages also represents an ideal-typical continua ranging from the Dame Stage which has similar characteristics as the "static" or "mechanical" models of formal organizations to the Stage of Meaning which is consistent with the "organic" or "dynamic" organizations.

At the Dame School Stage, the bulk of the teachers are ill-educated and are either untrained or have had only the sketchiest training [low complexity]. The syllabus is vague and skimpy, and the teachers fall back on the very narrow subject content they remember from their own school days [low diversification]. It consists of little but completely mechanical drill on the 3 R's, and the memorizing of relatively meaningless symbols occupies most of the time. The teacher's confusion and uncertainty spreads to the children, and, after some years of juggling with symbols with little real meaning, all except the brightest children
cease to make much progress \[low production\]....

In a less extreme form, the process of sealing off the mind with half-comprehended symbols may be responsible for waste \[low integration\] of educational effort in many places, and is possibly one of the prime causes of pupil wastage \(\text{low satisfaction}\) \(\text{pp. 58-59}\).

As schools develop, tighter structural restrictions are placed on the school system and a high degree of formalism is achieved \(\text{high formalization}\).

Activity methods and childish researches are shunned because they lead all too easily to the brink of the unknown; group methods can be tolerated only if a group leader is satisfied \(\text{which in this setting he almost invariable is}\) to ask the stock questions and accept the stock answers; the simplest things to teach are the 3 R's and a few selected facts that pass for history and geography \(\text{low diversification}\). The relations between teachers and pupils, however free they may be in the village, are stiff and formal in the classroom; and boredom \(\text{low satisfaction}\) and huge classes can lead to tight external discipline.... Seen from without, \[the school\] seems to call for characteristic forms of control; it is highly organized at a routine level \(\text{low diversification}\), there is a detailed and rigid official syllabus, a restricted number of narrow textbooks, tight external examination \(\text{high formalization}\), and a rigorous system of inspection of the work of both pupils and teachers. Teaching methods tend to be reduced to rules, and there may even be insistence on the 'one best way' of teaching any subject \(\text{low diversification}\) \(\text{pp. 60-62}\).

Finally, the essence of the Stage of Meaning

...is that meaning and understanding play an increasing part of the pupil's day \(\text{high adaptation}\), and memorizing and drill, while still remaining, become subservient to them \(\text{high diversification}\)....The child is encourage to build up, by his own mental
activity, the intricate web of relations
that constitute real meaning; in other words,
he is taught to think [high adaptation]

...The teacher with these wider goals will,
of necessity, adopt a type of classroom
discipline that is more relaxed and positive,
and his higher level of education and training
(high complexity) tends to give him the sense
of security that such a change demands. These
internal conditions cannot prevail unless
external controls [low formalization] of the
school are relaxed; external examinations will
either disappear or shrink in importance, and
inspection will shade into professional
cooperation. The gap between life of the
classroom and the life of the community is
reduced (pp. 67-68).

It seems appropriate, then, to apply a complex organiza-
tion perspective to the study of qualitative education in
developing countries. The structural dimensions of Beeby's
theory concerning educational development in developing
countries and their consequences for members of the educa-
tional system are consistent with the means and ends of the
"static-dynamic" or "mechanical-organic" models of organiza-
tions.

Means - Ends Dimensions of School Organization

Based on an examination of the literature on complex
organizations and the literature on aspects of education in
developing countries, eight major means-ends variables can
be identified: Complexity, Centralization, Formalization,
Diversification, Adaptation (adaptiveness), Goal Attainment
(production), Integration (efficiency) and Latency (school
satisfaction). As elaborated earlier, the four ends variables were selected on the basis of the work of Parsons, Bales, and Shils (1958), Hage (1965), and various international agencies. These are the four functional problems of a social system. Production is equivalent to their (Parsons et al., 1958) goal achievement; efficiency is equivalent to their integration; and adaptiveness is equivalent to their adaptation and school satisfaction is equivalent to latency (see also Hage, 1965: 292). Centralization, Formalization, Complexity, and Diversification (similar to Price's [1972:150] routinization) are major structural characteristics of organizations.

The four structural dimensions: Their definition

In this section, the four structural dimensions will be defined nominally, followed by a review of the empirical findings related to these means dimensions organized around the four end (goal) variables. Since the variables are interrelated there is much overlap.

**School complexity** Complexity in this study refers to horizontal differentiation and considers the way tasks performed by the organization are subdivided among its members (For other types of complexity see Hall, 1972).

Several specific definitions of horizontal complexity have been developed:
Complexity is "specialization in an organization...measured by the number of occupational specialties and the length of training required by each. The greater the number of occupations and the longer the period of training required, the more complex the organization" (Hage, 1965:294).

"Complexity may be defined as the degree of knowledge required to produce the output of a system. The degree of complexity of an organization can be measured by the degree of education of its members. The higher the education, the higher the complexity (Price, 1968:26).

"We interpret complexity to mean at least three things: number of occupational specialties, the professional activity, and the professional training (Hage and Aiken, 1967b:79).

Complexity is the "number of different positions and different subunits in the organization (Blau and Schoenherr, 1971:16)." An organization is more complex if it has more such positions and subunits.

Durkheim (1949) has suggested that the division of labor (complexity) is the single best indicator of the development of a society. More recently, Child (1973:169) noted that it "is frequently regarded as a major defining characteristic of modern organizations and also as an important determinant of other structural features."

Hall (1972) argues that complexity is more important than size for understanding organizations.

School centralization Centralization refers to patterns of decision-making in organizations. It is the
process whereby power, influence, and authority are allocated in the organization (Olsen, 1968:73-75). In some organizations authority is highly centralized, i.e., only one or a few people engage in decision-making. In others, on the other hand, there is widespread member participation in decision-making. Decentralization is where influence and authority over decision-making is widely diffused among a large number of participating members.

The degree of centralization has been identified by sociologists as one important structural dimension in the studies of complex organization. They have, however, not agreed on the most appropriate way of measuring it. Hage (1965) measured centralization by the proportion of occupations or jobs whose occupants participate in decision-making and the number of areas in which they participate. Fugh et al., (1969) identified the locus of authority in making organizational decisions. Blau and Schoenherr (1971) examined the level where personnel budget decisions are made. Corwin (1975) defined school centralization as the mean of teachers' judgments about the teachers' authority and freedom to make his own decisions over major educational decisions, small matters, and problems that come up in the classroom.

School formalization In the study of organizations, there is general consensus on the importance of formalization as a major structural dimension. There is not, however, agreement on its best measurement.
Pugh et al. (1969:116) distinguishes between two conceptual domains of formality: formalization and standardization. Formalization is the degree to which procedures are written down, and standardization is the degree to which procedures are rigidly followed. Hage (1965:293) and Hage and Aiken (1970:21-23), on the other hand, consider the two concepts together as formalization. These studies measure formalization by the proportion of codified jobs and the range of variation that is tolerated within the rules defining jobs. Blau and Schoenherr (1971:115) found it difficult to distinguish between "sheer existence of an elaborate body of civil service regulations" and how closely those regulations are followed in actual practice. "An indication of the degree of compliance with these personnel standards is the proportion of new appointments that conform to civil service procedures.... The only available measure of standardization of operating procedures, as distinct from personnel procedures is the use of objective criteria in the supervisory rating of the performance of subordinates."

Holdaway, Newberry, Hickson, and Heron (1975) used "written course outlines available to instructors" as one item in their scale of formalization.

Corwin (1975) defined it as

1. the degree of restrictions placed on personal and professional activities,
2. opportunity to engage in experimental, innovative activities,
3. flexibility permitted in the curriculum, and
4. encouragement of initiative and innovation in curriculum and teaching.

School diversification For Wilson (1966:198), diversity is partly a function of the complexity of the task structure.

the task structure (i.e., the sum of all tasks or one-man duties, in the organization) increases in complexity as the number of different tasks increases and as the proportion of nonroutine tasks increases. By nonroutine tasks we mean tasks that involve a minimum of prescribed, repetitive operations.

The Four Structural Dimensions: Previous Findings

Hage (1965) formulated three propositions derived from Weber's (1947) work on bureaucracy.

Weber felt that the bureaucratic arrangement was superior to other forms because it had more precision and speed, and reduced both material and personal costs. Part of his reasoning for the efficacy of bureaucracy was its superior discipline and control of role performance, for he specifically stated that if officials were elected instead of appointed, discipline and control would be weakened. The high formalization of offices or jobs results in the development of expertise in a limited area and therefore greater efficiency in performance with fewer errors being made.... There are individuals who have rules or standards by which to evaluate the performance of their subordinates, which not only results in more uniformity of behavior but in a higher volume of production as well (Hage, 1965:297).

Thus, Hage (1965) developed the following propositions:
I. The higher the centralization, the higher the production.

II. The higher the formalization, the higher the efficiency.

III. The higher the centralization, the higher the formalization.

In his study of school norms, Willard Waller indicated that "there is a traditional attitude toward student; this attitude requires that a certain distance be kept between teachers and students (1967:109). In formal interaction the status position of role encumbents is very important. Teachers, as status superiors, behave in such a way to ensure a certain distance between themselves and those in the lower status position of student. They direct activities and observe student behavior, but they do not participate in activities nor become emotionally involved with students. Formality is established through behavior mechanisms such as rigid rules and behavior expectations. Breeches of status are responded to harshly. Beeby identified the degree of formality as one of the distinguishing characteristics of educational development. A high level of formality exists when the classroom "...is highly organized at a routine level, there is a detailed and rigid official syllabus, a restricted number of narrow textbooks, tight external examinations, and a rigorous system of inspection of the work of both pupils"
and teachers. The teacher is afraid of any other questions in the classroom but those he himself asks, for they are the only ones to which he can be sure of knowing the answers. Activity methods and childish researchers are shunned because they lead all too easily to the brink of the unknown" (Beeby, 1966:61-62).

In informal interaction, the status relationships are flexible. The teacher is a participant in classroom activities and involvement derives not from his status position but from interests and a feeling of security in his own intellectual capabilities. "...he must feel intellectually sure enough to admit ignorance, and deliberately use it as a teaching aid" (Beeby, 1966:60).

This would suggest the following hypothesis:

The greater the formalization, the lower the school and student adaptation. With regards to formalization, however, one must keep in mind that "...in some countries the study of influence in education must begin with the fact that there is a national organization of education with important elements of hierarchical and formal control from national ministries to the region, the community, and the individual school.... In such countries, educational organization or educational administration or educational policy is related to this formal national system" (Clark, 1962:233-234).
Even though it is hypothesized that centralization increases formalization and production, other evidenced suggests that a highly centralized organization with stable patterns of status relationship impedes change (Bessent and Moore, 1967; Spicer, 1952). Along these lines, many authors believe that decentralized organizations are more innovative than centralized ones (Aiken and Hage, 1966; Cillie, 1940; Klingenberg, 1967; Thompson, 1967).

This would suggest the following hypothesis:

The greater the centralization, the lower the adaptation. Thompson (1961) noted that organizations which have a great deal of personnel who are highly specialized also exhibit a high degree of decentralization of authority. This occurs for the following reasons: (1) A person in authority must consult the specialist thus the specialist shares the decision-making with the authority. (2) Specialists strive for the right to make their own decisions. (3) Specialists need information from other specialists in the organization thus authority becomes more diffuse.

Hage and Aiken (1967a) in their study of sixteen social welfare and health agencies located in a large midwestern city found a high degree of complexity associated with a low degree of centralization. When organizations are complex decision making is more likely to be distributed among occupants of the diversified positions within the organization. These authors, in another study (1967b) found complexity to be
related to the adoption of new services and techniques.

Beeby has suggested that there are two strictly professional factors that determine the ability of an educational system to move from the Dame Stage to the Stage of Meaning and they are: (a) the level of general education of the teachers in the system, and (b) the amount and kind of training they have received. Some evidence for this has emerged in the United States. Paul Mort (Ross, 1958) examined school systems and found complexity related to the adoptions of change. Buley (1947) found the adoption of new teaching techniques to be highly correlated with the amount of professional training and experience of teachers. Furthermore, he found that change in educational practices in those schools which had the highest rates of teachers reading and traveling. "This research suggests that not only the level of training, but also continued education practices, such as reading and travel, are important in providing a stimulus for organizational change (Hage and Aiken, 1970:36). This would suggest the testing the following hypotheses:

The greater the complexity, the lower the centralization.

The greater the complexity, the greater the adaptation.

Studies of complex organizations have found a similar relationship between organization diversity and outputs like innovation, communication, and satisfaction (Wilson, 1966:198-207; Hage, Aiken, and Marrett, 1971:862; Argyris, 1965).
Wilson hypothesizes that the greater the diversity of an organization, the higher the probability of innovation activity in the organization.

Beeby has noted that some schools are rich in resource material, while others do not have even a few basic textbooks. Some schools encourage active exploration of subject matter; others are dull and boring. Beeby advocates that such variations in environments may account for the large primary school dropout rate in Less Developed Countries (LDC's). He believes that stimulating, diversified environments lead to creative, innovative children while dull and uniform environments lead to passive, bored, and unresponsive children (Beeby, 1966:61).

Translating this into Beeby's model of diversity in the school, one would hypothesize the less routine and boring the activities of the school day, the more creative the children will be in their classroom work. A diversification of activities and resources will lead to a higher level of student interest, involvement, and creativity. Diversification can then be defined as the range of forms of stimuli incorporated into the activities, curriculum and experience of the children and would suggest the following hypotheses:

The greater the diversification the greater the adaptation.
The greater the diversification the greater the satisfaction.

Summary of Hypotheses

1. The higher the complexity, the lower the centralization (Thompson, 1961; Hage, 1965; Hage and Aiken, 1967a).
2. The greater the centralization, the greater the formalization (Hage, 1965).
3. The greater the centralization, the greater the production (Hage, 1965).
4. The greater the formalization, the greater the efficiency (Hage, 1965).
5. The greater the formalization, the lower the adaptation (Waller, 1967; Beeby, 1966; Hage and Aiken, 1967a).
6. The greater the centralization, the lower the adaptation (Bessent and Moore, 1967; Spicer, 1952; Aiken and Hage, 1967b; Cillié, 1940; Klingenberg, 1967; Thompson, 1967).
7. The greater the complexity, the greater the adaptation (Hage and Aiken, 1970; Ross, 1958; Beeby, 1966).
8. The greater the diversity, the greater the adaptation (Wilson, 1966; Hage, Aiken, and Marrett, 1971; Argyris, 1965).
9. The greater the diversity, the greater the satisfaction (Wilson, 1966; Hage, Aiken, and Marrett, 1971; Argyris, 1965).
Development of the Measurement Model

Figure 2 represents these hypotheses in a causal model diagram. The arrows point in the direction of implied causation and a (+) sign or a (-) sign denote the direction of the association. The idea of time is very important to causal theory, and the initial causal ordering of events is assumed. The rationale for the sequence of events is provided by Paulson (1971:21).

(1) "Initially an organization has a certain degree of specialization of skills and tasks (complexity)....

(2) As complexity increases, the types of decisions to be made become more specified and more persons have either particular skills needed, or related job roles to qualify, for participation in specified decision making—decision making becomes more diffused and decentralized.

(3) As decision making becomes decentralized, the formal mechanisms for control of behavior become less effective due to lack of interpersonal contact, and informal methods, within decision making groups, replace them—formalization decreases" (Paulson, 1971:21).

(4) The combination of an increase in complexity, a decrease in formalization and centralization creates a more relaxed atmosphere where highly qualified...
Figure 2. Causal model of the effect of attributes of schools on goal areas
people feel free to experiment with new learning techniques which leads to greater diversification of classroom activities.

(5) When the increase of specialized skills, decentralization of decision making, and a decrease in formality of behavior standards and an increase in nonroutine techniques has occurred, then effectiveness of production increases, efficiency of production decreases, satisfaction and adaptation increase.

Summary

This chapter began by specifying four objectives for the development of a social indicator informational system for education.

The first objective was to deductively and inductively identify goal areas of the educational system. The goal areas of this study are an integration of various international agencies conducting work on social indicators and educational planning (OECD, SSDS, and the World Bank) and the theoretical work of Parsons.

The second objective was to develop output descriptive indicators. These were conceptualized as: Production, Adaptation, Integration, Latency. It was noted that in changing societies with uncertain futures, planning activities
activities and research related to planning activities need to consider a range of goals in order to be flexible enough to adapt to inevitable changes. By doing so, the relative feasibility of goals or the relative costs can be evaluated in terms of values, beliefs, and the social structure.

The third objective was to identify a relevant theoretical model which specifies several goal areas and the structural means to achieve them. Theory and research related to complex organization effectiveness was presented as the most useful model for abstracting some of the most essential elements which are related to the achievement of such goals. The author realizes, however, that even though "abstractions from details are essential, any usable model must be mis-specification of the system to which it refers. We have no option but to construct models which fall short of a complete specification of the system under examination" (Rausser, 1973: 274).

The final objective was to develop social indicator model which contained both output descriptive indicators as well as an alytic indicators. Hypotheses were derived from previous research related to the means-ends dimensions of organizations and a measurement model was developed. The next steps involve testing this model to see if it holds cross-culturally in school systems as complex organizations.
CHAPTER 3: METHODS AND PROCEDURES

Data Source and Sample

The description and analysis of the school as an organization is based on data collected by the International Project for the Evaluation of Educational Achievement (IEA).

The IEA survey is a massive attempt to take advantage of cross-national variation in order to identify factors accounting for differences in educational achievement within and between countries. It surveys student achievement in six subjects: science, reading comprehension, literature, civic education, and French and English as foreign languages. Twenty-two developed and developing countries are involved: Australia, Belgium, England, Federal Republic of Germany, Finland, France, Israel, Japan, Netherlands, Scotland, Sweden, The United States, Chile, Hungary, India, Iran, Ireland, Italy, New Zealand, Poland, Romania, and Thailand.

In addition to the test data, information was obtained on the students' background, interests, and attitudes, as well as on their teachers and schools.

The science, reading comprehension and literature data were gathered in 1970; and the French, English and Civics in 1971. The first three subjects shared the same sample at each age level in early all countries. Separate samples were drawn for each of the other three subjects. The testing was
conducted, in general, approximately three months before the end of the school year. The following levels of students were tested: 10 year olds (Population I), 14 year olds (Population II) and students in the last year of secondary school (Population IV).

Population I was defined as all students aged 10:00 - 10:11 at the time of testing. This population was chosen because at that age nearly all children can read. Population II was defined as all students aged 14:00 - 14:11 at the time of testing. This was the last point in most of the school systems where the whole aged group is still in school. Population IV was defined as all students who were in the terminal year of those full-time secondary education programs which were either pre-university programs or programs of the same length. National Centers also had the option of defining a Population III, a major terminal point in the school system between Population II and Population IV.

Sampling was conducted between the International Sampling Referee and the specialist at the National Research Institute responsible for drawing the National samples of schools and students. There was an International Technical Committee to decide on test administration, recording of data, and all aspects of the data analysis.

The final testing was conducted in 14 different languages. There were approximately two hundred fifty thousand students,
fifty thousand teachers, and ten thousand schools. There were approximately 700 pieces of data per student.

Drawing the Sample

If one is to compare the effect of specific structural characteristics of schools on various goal areas, it is essential that a representative sample of the population be drawn in order to provide meaningful results. In this regard, IEA sampled in order to insure that the samples represented the national groups, the different types of schools within these national groups, and representative students within each school. No attempt, however, was made to get those members of any age group who had never been in or had dropped out of school. (The following information was obtained from Thorndike, 1973; see also, Schweille and Marshall, 1975).

Groups excluded from the "Target Population"

1. Those individuals who had severe mental disability.
2. Those individuals who were more than a specified number of years retarded in their educational placement (This definition varied from country to country).
3. Those members of an age group who were not in school (this involved a fairly substantial number at the earlier age levels for "those in the developing countries in which universal education is still at best a policy rather than a practice" (Thorndike, 1973:45).
4. Some geographical regions were excluded (in India, the sample was limited to the six Hindi-speaking states in which Hindi is the language of instruction.)

The sampling plan

"The objective of the sampling plan was that every student in the target population should have an equal (and, of course, nonzero) chance of appearing in the designed sample for testing. This objective was achieved by adjusting both the size of the sample of students within a school and the number of schools within a given stratum in such a way that the number of pupils to be tested in each stratum bore a constant ratio to the total number of students in the stratum" (Thorndike, 1973:46).

The specific steps of the plan are as follows:

1. Specification of the bases of stratification of the target population in terms of either region or type of school or both for selecting schools within strata and students within schools.

2. Estimates were prepared of the total number of students in each stratum so that the number required for the sample could be determined.

3. A list was drawn of all the schools that fell within a given stratum.

4. A random sample of schools of the desired size was drawn from the list.
a. In some cases, where the selected school did not wish to participate, replacements were required.

5. Within schools, a random sample of students were selected whose birthdays fell upon randomly selected days of the month.

6. After the testing of such individuals, the actual number tested within each stratum was compared with the designed number for the sample in order to see whether some strata had been under- or over-sampled. Some degree of under- or over-sampling was almost universally the case (see Table 1A and 1B for stratum weights for India and USA). Age groups rather than grade groups were tested. India indicated an unspecified percent of 10-year-olds in grades 1 and 2 who were not tested either because they were retarded or not in school at all.

Preparation of instruments

International subject matter committees were set up for the preparation of the instruments. Subject matter committees were also set up in each of the countries for each of the subjects. Their task was to carry out a content analysis in terms of weightings of emphasis given in major textbooks to topics and objectives, a content analysis of what a panel of teachers said they taught. Furthermore, national committees were requested to submit test items to the international committee.
<table>
<thead>
<tr>
<th>Str</th>
<th>Supstr</th>
<th>Stratum name</th>
<th>Strwgt</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Cities over 1,000,000 pop., public schools</td>
<td>0.94</td>
<td>578</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>Cities over 1,000,000 pop., parochial schools</td>
<td>0.95</td>
<td>102</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>High ses cities, 250,000 to 1,000,000 pop., public schools</td>
<td>0.89</td>
<td>209</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>Middle ses cities, 250,000 to 1,000,000 pop., public schools</td>
<td>0.94</td>
<td>306</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Low ses cities, 250,000 to 1,000,000 pop., public schools</td>
<td>0.89</td>
<td>228</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>High ses cities, 250,000 to 1,000,000 pop., parochial schools</td>
<td>1.19</td>
<td>38</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>Middle ses cities, 250,000 to 1,000,000 pop., parochial schools</td>
<td>2.46</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>Low ses cities, 250,000 to 1,000,000 pop., parochial schools</td>
<td>1.09</td>
<td>37</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>High ses cities, 100,000 to 250,000 pop., public schools</td>
<td>0.91</td>
<td>79</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>Middle ses cities, 100,000 to 250,000 pop., public schools</td>
<td>1.25</td>
<td>115</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>Low ses cities, 100,000 to 250,000 pop., public schools</td>
<td>0.85</td>
<td>170</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>Cities 100,000 to 250,000 pop., parochial schools</td>
<td>1.00</td>
<td>59</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>High ses cities, 50,000 to 1,000 pop., public schools</td>
<td>2.82</td>
<td>38</td>
</tr>
<tr>
<td>14</td>
<td>3</td>
<td>Middle ses cities, 50,000 to 100,000 pop., public schools</td>
<td>0.81</td>
<td>238</td>
</tr>
<tr>
<td>15</td>
<td>4</td>
<td>Low ses cities, 50,000 to 100,000 pop., public schools</td>
<td>1.33</td>
<td>96</td>
</tr>
</tbody>
</table>

\(^a\)Strata.

\(^b\)Supstrata.
<table>
<thead>
<tr>
<th>Str</th>
<th>Supstr</th>
<th>Stratum name</th>
<th>Strwgt</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>5</td>
<td>Cities 50,000 to 100,000 pop., parochial schools</td>
<td>0.95</td>
<td>78</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>High ses cities, 25,000 to 50,000 pop., public schools</td>
<td>1.04</td>
<td>133</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
<td>Middle ses cities, 25,000 to 50,000 pop., public schools</td>
<td>0.97</td>
<td>192</td>
</tr>
<tr>
<td>19</td>
<td>4</td>
<td>Low ses cities, 25,000 to 50,000 pop., public schools</td>
<td>0.79</td>
<td>175</td>
</tr>
<tr>
<td>20</td>
<td>5</td>
<td>Cities 25,000 to 50,000 pop., parochial schools</td>
<td>1.05</td>
<td>78</td>
</tr>
<tr>
<td>21</td>
<td>2</td>
<td>High ses cities, 10,000 to 25,000 pop., public schools</td>
<td>1.87</td>
<td>60</td>
</tr>
<tr>
<td>22</td>
<td>3</td>
<td>Middle ses cities, 10,000 to 25,000 pop., public schools</td>
<td>1.40</td>
<td>80</td>
</tr>
<tr>
<td>23</td>
<td>4</td>
<td>Low ses cities, 10,000 to 25,000 pop., public schools</td>
<td>1.90</td>
<td>79</td>
</tr>
<tr>
<td>24</td>
<td>5</td>
<td>Cities 10,000 to 25,000 pop., parochial schools</td>
<td>2.10</td>
<td>33</td>
</tr>
<tr>
<td>25</td>
<td>2</td>
<td>High ses county units, public schools</td>
<td>1.11</td>
<td>366</td>
</tr>
<tr>
<td>26</td>
<td>3</td>
<td>Middle ses county units, public schools</td>
<td>1.27</td>
<td>720</td>
</tr>
<tr>
<td>27</td>
<td>4</td>
<td>Low ses county units, public schools</td>
<td>0.67</td>
<td>1060</td>
</tr>
<tr>
<td>28</td>
<td>5</td>
<td>County units, parochial schools</td>
<td>0.74</td>
<td>143</td>
</tr>
<tr>
<td>29</td>
<td>2</td>
<td>Nonparochial private schools</td>
<td>1.14</td>
<td>40</td>
</tr>
</tbody>
</table>

Total 5550
Table 1B. Stratification code for India

<table>
<thead>
<tr>
<th>Str</th>
<th>Supstr</th>
<th>Stratum name</th>
<th>Strwgt</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Large urban schools, boys</td>
<td>1.00</td>
<td>76</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Large urban schools, coeducational</td>
<td>1.00</td>
<td>147</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Large urban schools, girls</td>
<td>1.00</td>
<td>67</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Medium-sized urban schools, boys</td>
<td>1.00</td>
<td>35</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Medium-sized urban schools, coeducational</td>
<td>1.00</td>
<td>184</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>Small urban schools, boys</td>
<td>1.00</td>
<td>34</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>Small urban schools, coeducational</td>
<td>1.00</td>
<td>16</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>Small urban schools, girls</td>
<td>1.00</td>
<td>41</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Large rural schools, boys</td>
<td>1.00</td>
<td>66</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>Large rural schools, coeducational</td>
<td>1.00</td>
<td>191</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>Medium-sized rural schools, boys</td>
<td>1.00</td>
<td>289</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>Medium-sized rural schools, coeducational</td>
<td>1.00</td>
<td>715</td>
</tr>
<tr>
<td>16</td>
<td>3</td>
<td>Small rural schools, boys</td>
<td>1.00</td>
<td>120</td>
</tr>
<tr>
<td>17</td>
<td>6</td>
<td>Small rural schools, coeducational</td>
<td>1.00</td>
<td>717</td>
</tr>
<tr>
<td>18</td>
<td>3</td>
<td>Small rural schools, girls</td>
<td>1.00</td>
<td>33</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Medium-sized urban schools, girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>Large rural schools, girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>Medium-sized rural schools, girls</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total 2731

Large: More than 75 students enrolled in the highest grade.
Medium-sized: 30-75 students enrolled in the highest grade.
Small: up to 29 students enrolled in the highest grade.

\(^a\text{Strata.}\)

\(^b\text{Supstrata.}\)
Once the preliminary versions were produced, national committees were asked to comment on them, and preliminary versions were modified on the basis of these comments before being submitted for pretesting. When the instruments were pretested, item analyses were performed and national committees were asked to comment on item analyses. On the basis of the item analyses and the comments of the National committees the international committees proposed a final pretest version, and national committees were again asked to comment on items. On the basis of these comments and in some cases, several pretesting, the final versions of the tests were constructed.

In addition to the cognitive instruments, a number of attitude and descriptive scales were developed. These included: like/dislike school, need achievement, interest in science, science and self, science and the world, literary transfers (perceived participation in fictional literary situations), literary interest, science teaching (traditional textbooks versus experimental continuum), science laboratories (given instructions versus own experiments continuum), and school environment (authoritarian versus permissive continuum).

Questionnaires were also produced for students, teachers, school head-masters, and national experts on education. Student questionnaires elicited detailed information about the home environment; teacher questionnaires elicited more detailed information about training; questionnaires for school head-masters elicited more detailed information about decision-
making and allocation of resources; questionnaires for national experts elicited more information about the society, economy, policy, and culture. (For further details, see Schwille, John and Susanne Marshall, 1975. The IEA Six-Subject Data Bank: A General Introduction. Unpublished mimeo, University of Stockholm: Sweden.)

Sub-sample for this Study

Due to the limitations of resources and time this study used a sub-sample of the total IEA study. Information was attained from Population I, their schools, and teachers for India and the United States of America. Resources available allowed only the analysis (data) for two countries. India and the USA were chosen because they were similar in respect to being democracies yet diverse in most other factors. This was felt to be important in order to maximize the variation is some of the organizational variables, i.e. centralization. The data were originally stored with the student as the unit of analysis. Since this study examines schools as complex organizations, the data was aggregated to this level through the use of SPSS programming. (See Table 2 for school characteristics.) If the purpose of any science is to develop a valid, precise, and verified general theory (Holt and Turner, 1970), cross-cultural research is absolutely essential. Sociologists can not take issue with Murdock's (1957:250)
Table 2. Characteristics of schools

<table>
<thead>
<tr>
<th>Category</th>
<th>India</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban</td>
<td>18</td>
<td>79</td>
</tr>
<tr>
<td>Suburban</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td>Rural</td>
<td>135</td>
<td>29</td>
</tr>
<tr>
<td>Urban and suburban</td>
<td>13</td>
<td>29</td>
</tr>
<tr>
<td>Urban and rural</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Suburban and rural</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>Urban, suburban and rural</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Missing</td>
<td>3</td>
<td>13</td>
</tr>
</tbody>
</table>

The statement that "there can never be any generally valid science of man which is not specifically adapted to, and tested with reference to the diverse manifestations of human behavior encountered in the thousands of human societies differing from our own...." The most rigorous scientific method is achieved through deduction and the testing cross-culturally of hypotheses from theoretical propositions. The concepts that are used in hypotheses testing must be nonculture-bound. The development of concepts and hypotheses related to complex organizations claim such characteristics and, have, indeed, been subjected to cross-cultural research. Gaps in our
knowledge, however, concerning the types and effects of structural characteristics of complex organizations still exist. To be sure, such research often comes up with mutually exclusive results. Not only is this distressing for sociological theory construction, but is also unfortunate for the policy-maker who needs the "translated" implications of theory and research. The cross-national sample in this study was chosen in the humbled expectation that further understanding of complex organizations may be obtained and thereby advance our scientific understanding of such organizations as well as be useful to policy-makers. Yet, cross-cultural secondary analysis suffers from many limitations, and this study is not exception from that generalization. Such limitations include:

1. It is not always possible to operationalize theoretical concepts as precisely as one would like and therefore the researcher must often "make do" with what is available in the collected information, especially in those cases where the model and concepts are developed after the schedule has been administered. In this case, however, the original study collected data very relevant to the model in this study. The theoretical model was developed prior to the examination of the responses to the items in the schedule.

2. Data from the developing countries has often been noted to be incomplete or inaccurate. Missing data from India posed some difficulties in the operationalization of concepts and the final analysis. Since the amount of missing data
varied by variable, the number of cases are reported for each of the relationships examined in the Findings Chapter.

3. There are problems in secondary analysis with such mundane factors, such as obtaining the correct information from the tape. To insure that valid data were coming from the tape, data checks were made between tape output and previous publications (such as, Thorndike, 1973 and Comber and Keeves, 1973).

Population I was chosen as a result of an interest in the work of Beeby (1966) and his Stage Theory concerning educational quality in developing areas at the primary school age. There could be little argument regarding the importance of science and reading comprehension for both the developed and developing countries. Literacy is the foundation on which all subsequent education can proceed, and "its importance in the educational scene is attested to not only by the attention that is paid to it within the classroom but also by the enormous literature that has developed around the teaching of reading and the process of learning to read" (Thorndike, 1973:13). "The importance attached to science teaching in national systems of education is indicated by the fact that of the 20 countries participating in the Six Subject Study, all except Israel carried out some testing in science, and 15 of them in all three populations, I, II, and IV" (Comber and Keeves, 1973:17).
Variable Measures

The four goals

The four goals in this study were a synthesis of the international work of SSDS, OECD, and The World Bank related to policy goals in education and the theoretical work of Talcott Parsons, as elaborated by Hage (1965) and previously discussed in the Theory Chapter. The four goals are: Efficiency, Satisfaction, Production, and Adaptation.

Measurement of the four goals

Measures of the four goals were taken from responses from the school, teacher, and student questionnaires (see Appendix A for questionnaires). The means and standard deviations for the four goal areas for the US and India are presented in Table 3.

Efficiency Efficiency was operationally defined as the cost per pupil. It is assumed that the lower the cost the higher the efficiency for the school. The measurement in this study is the ratio of teacher salaries to the total number of students in the school. IEA has noted that the budget variables were very unreliable in some countries. Teacher salaries were used in this study after an examination of all the budget items; and, the assumption was made that teacher salaries would be the most reliable among them. Furthermore, more schools reported this budget item as compared to any of
<table>
<thead>
<tr>
<th>Four goals</th>
<th>USA</th>
<th></th>
<th>Standard deviation</th>
<th>India&lt;sup&gt;a&lt;/sup&gt;</th>
<th></th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td></td>
<td>N</td>
<td>Mean</td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>241</td>
<td>1161.0806</td>
<td>1766.5083</td>
<td>138</td>
<td>221.895</td>
<td>672.150</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>270</td>
<td>+3.2708</td>
<td>2.1967</td>
<td>182</td>
<td>+4.8767</td>
<td>3.1881</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>272</td>
<td>18.0292</td>
<td>5.2693</td>
<td>181</td>
<td>8.4971</td>
<td>7.3481</td>
</tr>
<tr>
<td>Reading</td>
<td>266</td>
<td>17.0053</td>
<td>5.8272</td>
<td>182</td>
<td>8.5342</td>
<td>8.6129</td>
</tr>
<tr>
<td>Adaptation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>266</td>
<td>7.5721</td>
<td>2.6936</td>
<td>131</td>
<td>8.2061</td>
<td>3.5900</td>
</tr>
<tr>
<td>Student</td>
<td>272</td>
<td>32.1735</td>
<td>1.6252</td>
<td>178</td>
<td>32.0203</td>
<td>5.0497</td>
</tr>
</tbody>
</table>

<sup>a</sup>Rupees converted to dollars: 7.576 per dollar (International Financial Statistics, 1971).
the other budget items. The currency for India was recorded in rupees and transferred to dollars. The exchange rate was computed for December 1970 (the year the data was collected.) At that time, each dollar equalled 7.576 rupees (International Financial Statistics, 1971).

Satisfaction  "Satisfaction is the degree to which the members of a social system have a positive affective orientation toward membership in the system" (Price, 1972:156). The satisfaction or "Like School" scale was constructed by IEA as a measure of satisfaction and is composed of the questions reported in Table 4 and their scoring. The 12 items are scored from -1 to +1. The range of responses are -12 to +12. In the original scale, a negative score had a positive meaning. For this study, all such scores were multiplied by -1 so that a positive response would identify a positive affective orientation toward membership in the system. The larger the score, the greater the satisfaction. The schools in India had a mean satisfaction score of 4.8768 and a standard deviation of 3.1881 while the mean score of the schools for the US was 3.2708 and a standard deviation of 2.1967. The median reliability of the scale was reported to be .70 for Population I for students in all countries as reported in Comber and Keeves (1973:101).

Production  Production is operationally defined as acquired skills and knowledge as reflected in the science and
Table 4. Like school scale

<table>
<thead>
<tr>
<th>Question</th>
<th>Scale values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agree</td>
</tr>
<tr>
<td>1. The most enjoyable part of my life is the time I spent in school.</td>
<td>-1</td>
</tr>
<tr>
<td>3. I generally dislike my school work.</td>
<td>+1</td>
</tr>
<tr>
<td>6. There are many school subjects I don't like.</td>
<td>+1</td>
</tr>
<tr>
<td>8. I want as much education as I can get.</td>
<td>-1</td>
</tr>
<tr>
<td>10. I enjoy everything about school.</td>
<td>-1</td>
</tr>
<tr>
<td>11. I find school challenging.</td>
<td>-1</td>
</tr>
<tr>
<td>13. School is not very enjoyable.</td>
<td>+1</td>
</tr>
<tr>
<td>15. The only things I can look forward to in school are weekends and holidays.</td>
<td>+1</td>
</tr>
<tr>
<td>19. Are you more interested in games than school work?</td>
<td>+1</td>
</tr>
<tr>
<td>20. The only thing I like about going to school is the opportunity to meet my friends.</td>
<td>+1</td>
</tr>
<tr>
<td>21. I hope eventually to study at a college or university.</td>
<td>-1</td>
</tr>
<tr>
<td>23. I agree with people who say, &quot;school days are the happiest days.&quot;</td>
<td>-1</td>
</tr>
</tbody>
</table>
reading achievement tests administered to the students. The greater the score, the greater the production. The items for each of these tests are listed in Appendix A.

**Science achievement tests** For Population I, science tests A and B were administered. Scores were corrected for guessing. The range of scores varied between -10.0 to 40. The reliabilities (Kuder-Richardson 20) for the total science test was .84 for India and .86 for the US as reported in Comber and Keeves (For a complete discussion of the science tests see Comber and Keeves, 1973.). The mean science score for India was 8.4971 with a standard deviation of 7.3481 (N = 181). The mean science score for USA was 18.0292 with a standard deviation of 5.2693 (N = 272).

**Reading comprehension** For Population I, two tests each planned to take 25 minutes and each composed of four passages included jointly a total of 45 items. Reliability coefficients for the reading comprehension total score were computed by Thorndike (1973) and are presented in Table 5. The estimate in the first column was derived by Kuder-Richardson Formula 20 (Kuder and Richardson, 1937) and is based on the internal consistency of all the items in the test. The estimate in the second column is based on the correlation between two subtests that were separately timed and designed to be equivalent in difficulty and nature. The correlation shown has been corrected by the Spearman-Brown Prophecy
Table 5. Reliability of reading comprehension total score\(^a\)

<table>
<thead>
<tr>
<th>Country</th>
<th>10-year-olds</th>
<th>Alternative form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KR-20</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>.835</td>
<td>.753</td>
</tr>
<tr>
<td>USA</td>
<td>.888</td>
<td>.867</td>
</tr>
</tbody>
</table>


Formula (Stanley, 1971) to yield an estimate of reliability for the total test (For a complete discussion of Reading Comprehension Tests see Thorndike, 1973.). The mean reading comprehension total score for India was 8.5342 with a standard deviation of 8.6129 (N = 182). For the USA, the mean was 17.0053 with a standard deviation of 5.8272 (N = 266).

**Student adaptation**

Student adaptation is operationally defined as the degree to which student's responses to science activity questions reflects a problem oriented search for knowledge and understanding about the real world rather than a departmentalized division of knowledge about that world. The measure for student adaptation was obtain from information collected from students concerning
their interests and behavior in regard to selected science activities. Questions in Table 6 were used. An index of Student Adaptation is the sum of these items. Possible scores ranged from 18 - 50. The higher the score, the higher the adaptation. Coefficient alpha was used on the school data to obtain an estimate of reliability. Table 7 presents the mean, standard deviation, reliability, and number of cases for student adaptation, by country.

School adaptation School adaptation is operationally defined as the amount of innovative programs in the school. School adaptation data were collected by means of the following questionnaire items.

Do you have any provision for remedial teaching or tutoring in each of the following subject areas? Mathematics, Science, Reading, Language of instruction of school. If the innovation was available it was scored a "3;" if it was available in the cases of "great need only" it was scored a "2;" if it was not available at all, it was scored "1." The measure for school adaptation was obtained by summing the four items. The range of scores was from 4 to 12. The higher the score the greater the adaptation. The reliability (coefficient alpha) for School adaptation for India was .9565 (N = 131) with a mean of 8.206 and a standard deviation of 3.59; and for the USA the reliability was .8574 (N = 226) with a mean of 7.572 and a standard deviation of 2.6936.
Table 6. Student adaptation scale

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. I would like to study Science after the end of this school year.</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>3</td>
</tr>
<tr>
<td>B. Not sure</td>
<td>2</td>
</tr>
<tr>
<td>C. No</td>
<td>1</td>
</tr>
<tr>
<td>4. I hope that in my career I will be able to make use of some of the Science I learned at school.</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>3</td>
</tr>
<tr>
<td>B. Not sure</td>
<td>2</td>
</tr>
<tr>
<td>C. No</td>
<td>1</td>
</tr>
</tbody>
</table>

BELOW IS A LIST OF THINGS YOU MIGHT DO OUTSIDE SCHOOL. Look at each one and if it is something you do very often or used to do very often, mark A. If you have ever done it at all, mark B. If you have never done it, mark C.

5. Visit a Science museum
   A. Often     3
   B. Sometimes 2
   C. Never    1

6. Go to meetings of a scientific club.
   A. Often  3
   B. Sometimes 2
   C. Never 1

7. Build working models of ships, cars or aeroplanes
   A. Often  3
   B. Sometimes 2
   C. Never 1

8. Build a radio set or other piece of electronic apparatus.
   A. Often 3
   B. Sometimes 2
   C. Never 1

9. Visit an airfield to watch the planes.
   A. Often 3
   B. Sometimes 2
   C. Never 1
<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Visit a harbour to watch the ships.</td>
<td></td>
</tr>
<tr>
<td>A. Often</td>
<td>3</td>
</tr>
<tr>
<td>B. Sometimes</td>
<td>2</td>
</tr>
<tr>
<td>C. Never</td>
<td>1</td>
</tr>
<tr>
<td>A. Often</td>
<td>3</td>
</tr>
<tr>
<td>B. Sometimes</td>
<td>2</td>
</tr>
<tr>
<td>C. Never</td>
<td>1</td>
</tr>
<tr>
<td>12. Look at the moon or the planets through a telescope.</td>
<td></td>
</tr>
<tr>
<td>A. Often</td>
<td>3</td>
</tr>
<tr>
<td>B. Sometimes</td>
<td>2</td>
</tr>
<tr>
<td>C. Never</td>
<td>1</td>
</tr>
<tr>
<td>13. Do Chemistry experiments with your own equipment.</td>
<td></td>
</tr>
<tr>
<td>A. Often</td>
<td>3</td>
</tr>
<tr>
<td>B. Sometimes</td>
<td>2</td>
</tr>
<tr>
<td>C. Never</td>
<td>1</td>
</tr>
<tr>
<td>14. Make a hobby of studying or collecting flowers or leaves.</td>
<td></td>
</tr>
<tr>
<td>A. I do it</td>
<td>3</td>
</tr>
<tr>
<td>B. I would like to</td>
<td>2</td>
</tr>
<tr>
<td>C. I am not interested</td>
<td>1</td>
</tr>
<tr>
<td>15. Make a hobby of studying or collecting insects.</td>
<td></td>
</tr>
<tr>
<td>A. I do it</td>
<td>3</td>
</tr>
<tr>
<td>B. I would like to</td>
<td>2</td>
</tr>
<tr>
<td>C. I am not interested</td>
<td>1</td>
</tr>
<tr>
<td>16. Make a hobby of studying or collecting rocks or fossils.</td>
<td></td>
</tr>
<tr>
<td>A. I do it</td>
<td>3</td>
</tr>
<tr>
<td>B. I would like to</td>
<td>2</td>
</tr>
<tr>
<td>C. I am not interested</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 6 (Continued)

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Our Science lessons include laboratory experiments in which we all take part.</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>2</td>
</tr>
<tr>
<td>B. No</td>
<td>1</td>
</tr>
<tr>
<td>20. We make observations and do experiments during our Science lessons.</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>2</td>
</tr>
<tr>
<td>B. No</td>
<td>1</td>
</tr>
<tr>
<td>21. The teacher gives us questions to answer while we do our experiments</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>2</td>
</tr>
<tr>
<td>B. No</td>
<td>1</td>
</tr>
<tr>
<td>22. We usually make up our own problems and design our own experiments</td>
<td></td>
</tr>
<tr>
<td>A. Yes</td>
<td>2</td>
</tr>
<tr>
<td>B. No</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7. Mean, standard deviation, reliability, and number of cases for student adaptation by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Reliability</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>32.1735</td>
<td>1.6252</td>
<td>.74</td>
<td>272</td>
</tr>
<tr>
<td>India</td>
<td>32.0203</td>
<td>5.0497</td>
<td>.89</td>
<td>178</td>
</tr>
</tbody>
</table>
The four structural characteristics of organizations

The four structural characteristics of organizations which have been shown to be related to organizational effectiveness were theoretically defined in the previous chapter. These were complexity, centralization, diversification, and formalization. The next task of this study is to operationally define them for analysis. Table 8 presents the mean, standard deviation, number of cases and reliability of the four measures by country.

School complexity "Complexity is the degree of structural differentiation within a social system" (Price, 1972:70). Complexity was operationally defined as the number of occupations requiring specialized knowledge. The data on occupations were collected by means of the following questionnaire items.

How many of the following persons (full-time equivalent) provide a service in your school? (Round to the nearest whole number).

<table>
<thead>
<tr>
<th>Occupation</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>more</th>
</tr>
</thead>
<tbody>
<tr>
<td>School librarian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory Assistant or Technician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Counselor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Psychologist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Worker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aide or Ancillary teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Language Assistant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complexity is the sum total of the number of occupations requiring specialized knowledge. The range was from zero to eight. The mean for India was .385 and the standard deviation was 1.224 (N = 182). For the US the mean was 2.524 and the
Table 8. The mean, standard deviation, number of cases, and reliability for structural measures of organizations, by country

<table>
<thead>
<tr>
<th>Structural Measure</th>
<th>USA</th>
<th></th>
<th>USA</th>
<th></th>
<th>India</th>
<th></th>
<th>India</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>2.524</td>
<td>1.731</td>
<td>272</td>
<td></td>
<td>0.385</td>
<td>1.224</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td>Centralization</td>
<td>34.7899</td>
<td>5.5880</td>
<td>0.5635</td>
<td>180</td>
<td>42.7239</td>
<td>5.6188</td>
<td>0.6368</td>
<td>134</td>
</tr>
<tr>
<td>Diversification</td>
<td>14.22</td>
<td>2.459</td>
<td>0.7207</td>
<td>256</td>
<td>9.97</td>
<td>3.135</td>
<td>0.6407</td>
<td>111</td>
</tr>
<tr>
<td>Formalization</td>
<td>4.1</td>
<td>1.2575</td>
<td>259</td>
<td></td>
<td>3.8</td>
<td>0.9569</td>
<td>177</td>
<td></td>
</tr>
</tbody>
</table>
standard deviation was 1.731 (N = 272). The larger the score, the greater the complexity.

**School centralization**  
"Centralization is the degree to which power is concentrated in a social system" (Price, 1972: 43). Centralization was operationally defined as "the degree of participation in decision-making" (Hage and Aiken, 1967:77). Decision making data were collected by means of the following questionnaire items.

By whom is the real decision made in the following matters: (indicate wherever appropriate).

<table>
<thead>
<tr>
<th>Choosing textbooks</th>
<th>Teacher or subj comm. of teach.</th>
<th>head of school</th>
<th>local or central authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making rules and regulations for students in school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choosing teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determining conditions of employment of teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting students for entrance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deciding on major expenditure of money</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determining size of tuition fees (if any)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

An index of actual participation is the result of information scored in the following manner: a teacher is scored 1; teacher and head of school is scored 2; teacher, head, and outside authority is scored 3; teacher and outside head is scored 4; head is scored 5; outside authority and head is scored 6; and outside authority is scored 7. For India the
mean was 42.7239 with a standard deviation of 5.6188 and a reliability (coefficient alpha) of .6368 (N = 134). For the United States, the mean was 34.7899 and the standard deviation was 5.5880 with a reliability (coefficient alpha) of .5635 (N = 180). The higher the score, the higher the centralization.

School diversification Diversification is the degree to which school activities are varied. Operationally, diversification is measured by the types of programs available to students as reported by teachers. Information on programs available to students was collected by means of the following questionnaire items.

Indicate how often you use each of the following in your instruction. (Indicate one answer for each kind)

<table>
<thead>
<tr>
<th></th>
<th>A. Often</th>
<th>B. Sometimes</th>
<th>C. Rarely or Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Textbooks</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>28. Printed drill material</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>29. Individualized material (e.g. Programmed instruction)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>30. Small group work</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>31. Individual tutoring or individual conferences for students</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>32. Audio-visual materials - TV, films, slides, radio, etc.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>33. Field trips and special projects</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>34. Lectures</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>35. Questioning</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>36. Discussion</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
The total score is the sum total of responses. The mean for India was 9.97 with a standard deviation of 3.135 (N = 111), and a reliability (coefficient alpha) of .6407. The mean for the US was 14.22 with a standard deviation of 2.459 (N = 256) and a reliability (coefficient alpha) of .7207. The higher the score the greater the diversification.

**School formalization**

Definition: Rushing (1966) defines formalization as the use of formal rules and surveillance. He defined rules as "including productivity norms, objective measures of performance, and behavior rules." Surveillance was defined as "supervision through direct observation, face-to-face contact." This study uses the degree of surveillance of teacher activities as its operationalization of school formalization. The data were collected by means of the following questionnaire item.

How frequently do inspectors (superintendents, supervisors, advisors, etc.) visit your school (indicate one).

- Never 1
- Less than once a year 2
- Once a year 3
- Twice a year 4
- More than twice a year 5

The response pattern alternatives are assumed to be a continuum with "more than twice a year scored 5; "twice a year" scored 4; "once a year" scored 3; "less than once a year" scored 2; and "never" scored 1. The mean response for India was 3.8 with a standard deviation of .9596 (N = 177)
and the US was 4.1 with a standard deviation of 1.2575 ($N = 259$). The higher the score the greater the formalization.

**Statistical Analyses**

Correlation, multiple regression and path analysis are the statistical methods utilized to test the hypotheses presented in the last chapter. The findings reported in the next chapter will be considered significant at the .05 level or better.
CHAPTER 4: FINDINGS

Introduction

In Chapter 2, the Theory Chapter, major theoretical concepts related to complex organizations were identified and defined. Evidence related to the relationship among these variables was reviewed. The specification of bivariate relationships derived from the literature was stated in hypothesis form. Nine such hypotheses were identified. Finally, a measurement model was developed in order to test the fit of a theory related to the effects of certain structural characteristics of organizations on organizational effectiveness to empirical data. Chapter 3 described the methods followed in the specification of a sample and the operationalization of the previously identified theoretical concepts.

The present chapter is to present the results from testing the nine derived hypotheses. Such tests are to be accomplished by tests of significance based on Pearson zero-order correlations. Secondly, the theoretical model is to be analyzed by multiple regression. This method combines the predictive power of several independent variables on one dependent variable. The multiple correlation coefficient, $R$, indicates how well the multiple regression equation is able to predict scores on the dependent variable. Path analysis or the use of standardized multiple regression equations is utilized to compare a model of
the relationships which have been hypothesized to hold between several variables to observed data in this study, in order to examine the fit of the model to the data. For the model in this study path coefficients are identical to $b^*$ coefficients in the standardized multiple regression equation where the regression equation reflects the structure of the model being tested.

Results of Bivariate Analyses

Table 9 and Table 10 shows zero-order correlation for the scales assessing the relationships among all the variables in the model, plus their means, standard deviations, and number of cases (in parentheses) for India and the USA.

Structural configuration of organizations

Table 11 and Table 12 shows zero-order correlation for the scales assessing the relationship among the four structural characteristics of complex organizations for India and the USA. Of specific interest in the testing of the following hypotheses:

1. The greater the complexity, the lower the centralization.

2. The greater the centralization, the greater the formalization.

Hypothesis 1 is supported for both countries. The negative relationship between complexity and centralization is
Table 9. Correlation matrix, means, and standard deviations of variables in the model: India

<table>
<thead>
<tr>
<th></th>
<th>X₁</th>
<th>X₂</th>
<th>X₃</th>
<th>X₄</th>
</tr>
</thead>
<tbody>
<tr>
<td>X₁ Complexity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X₂ Centralization</td>
<td>-.2477</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(153)²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X₃ Formalization</td>
<td>.0518</td>
<td>.1443</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(177)²</td>
<td>(151)²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X₄ Diversification</td>
<td>-.0702</td>
<td>.0468</td>
<td>-.1226</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(111)²</td>
<td>(95)²</td>
<td>(107)²</td>
<td></td>
</tr>
<tr>
<td>X₅ Efficiency</td>
<td>-.0060</td>
<td>.0927</td>
<td>.0382</td>
<td>.0584</td>
</tr>
<tr>
<td></td>
<td>(138)²</td>
<td>(120)²</td>
<td>(135)²</td>
<td>(89)²</td>
</tr>
<tr>
<td>X₆ Science Achievement</td>
<td>.0948</td>
<td>-.0482</td>
<td>.0347</td>
<td>-.0059</td>
</tr>
<tr>
<td></td>
<td>(181)²</td>
<td>(152)²</td>
<td>(177)²</td>
<td>(111)²</td>
</tr>
<tr>
<td>X₇ Reading Achievement</td>
<td>.0399</td>
<td>-.0468</td>
<td>.0381</td>
<td>-.0931</td>
</tr>
<tr>
<td></td>
<td>(182)²</td>
<td>(153)²</td>
<td>(177)²</td>
<td>(111)²</td>
</tr>
<tr>
<td>X₈ School Adaptation</td>
<td>.1788</td>
<td>-.1792</td>
<td>-.0758</td>
<td>.0118</td>
</tr>
<tr>
<td></td>
<td>(131)²</td>
<td>(118)²</td>
<td>(128)²</td>
<td>(82)²</td>
</tr>
<tr>
<td>X₉ Student Adaptation</td>
<td>.1573</td>
<td>-.0445</td>
<td>.0033</td>
<td>-.0645</td>
</tr>
<tr>
<td></td>
<td>(178)²</td>
<td>(151)²</td>
<td>(174)²</td>
<td>(110)²</td>
</tr>
<tr>
<td>X₁₀ Satisfaction</td>
<td>.0433</td>
<td>-.0727</td>
<td>.0383</td>
<td>-.0665</td>
</tr>
<tr>
<td></td>
<td>(182)²</td>
<td>(153)²</td>
<td>(177)²</td>
<td>(111)²</td>
</tr>
</tbody>
</table>

Mean  
.3846  37.569  3.802  9.965

Standard Deviation  
1.2238  4.943  .9596  3.135

N  
182  153  177  111

¹Number of cases in parentheses.
<table>
<thead>
<tr>
<th></th>
<th>x_5</th>
<th>x_6</th>
<th>x_7</th>
<th>x_8</th>
<th>x_9</th>
<th>x_10</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0200</td>
<td>0.0469</td>
<td>0.0424</td>
<td>-0.0696</td>
<td>0.0662</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(137)</td>
<td>(138)</td>
<td>(97)</td>
<td>(135)</td>
<td>(138)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7187</td>
<td>0.0394</td>
<td>0.2228</td>
<td>-0.1630</td>
<td>0.5560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(181)</td>
<td>(130)</td>
<td>(131)</td>
<td>(178)</td>
<td>(181)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-0.0469</td>
<td>-0.2128</td>
<td>-0.2128</td>
<td>0.5691</td>
<td>0.1030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(138)</td>
<td>(178)</td>
<td>(178)</td>
<td>(182)</td>
<td>(121)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0424</td>
<td>-0.0221</td>
<td>-0.0221</td>
<td>0.1030</td>
<td>0.1591</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(97)</td>
<td>(127)</td>
<td>(127)</td>
<td>(178)</td>
<td>(178)</td>
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<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>221.895</td>
<td>8.497</td>
<td>8.534</td>
<td>8.206</td>
<td>32.02</td>
<td>4.87</td>
</tr>
<tr>
<td>672.150</td>
<td>7.348</td>
<td>8.613</td>
<td>3.590</td>
<td>5.049</td>
<td>3.1881</td>
</tr>
<tr>
<td>138</td>
<td>181</td>
<td>182</td>
<td>131</td>
<td>178</td>
<td>182</td>
</tr>
</tbody>
</table>
Table 10. Correlation matrix, means, and standard deviations of variables in the model: USA

<table>
<thead>
<tr>
<th></th>
<th>$X_1$</th>
<th>$X_2$</th>
<th>$X_3$</th>
<th>$X_4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$X_1$ Complexity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_2$ Centralization</td>
<td>-0.1467</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0484</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_3$ Formalization</td>
<td></td>
<td>0.1407</td>
<td>0.0117</td>
<td>-0.1204</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_4$ Diversification</td>
<td></td>
<td>0.0559</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_5$ Efficiency</td>
<td></td>
<td></td>
<td>-0.0791</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_6$ Science Achievement</td>
<td></td>
<td></td>
<td>-0.0750</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_7$ Reading Achievement</td>
<td></td>
<td></td>
<td>-0.0829</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_8$ School Adaptation</td>
<td></td>
<td></td>
<td>0.3010</td>
<td>-0.3495</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_9$ Student Adaptation</td>
<td></td>
<td></td>
<td>0.0739</td>
<td>0.0116</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$X_{10}$ Satisfaction</td>
<td></td>
<td></td>
<td>0.0268</td>
<td>0.0657</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mean: 2.524 30.4373 4.0860 14.222
Standard Deviation: 1.731 4.9482 1.2575 2.4599
N: 272 212 259 256

*aNumber of cases in parentheses.*
<table>
<thead>
<tr>
<th>$x_5$</th>
<th>$x_6$</th>
<th>$x_7$</th>
<th>$x_8$</th>
<th>$x_9$</th>
<th>$x_{10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.0251</td>
<td>.9042</td>
<td>-.0202</td>
<td>.0907</td>
<td>-.0681</td>
<td></td>
</tr>
<tr>
<td>(.241)</td>
<td>(266)</td>
<td>(226)</td>
<td>(222)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-.0267</td>
<td>-.0278</td>
<td>-.0537</td>
<td>-.0681</td>
<td>.0741</td>
<td>.1568</td>
</tr>
<tr>
<td>(.236)</td>
<td>(272)</td>
<td>(266)</td>
<td>(226)</td>
<td>(265)</td>
<td>(225)</td>
</tr>
<tr>
<td>.0074</td>
<td>.1386</td>
<td>.0741</td>
<td>.1568</td>
<td>.1295</td>
<td></td>
</tr>
<tr>
<td>(.240)</td>
<td>(270)</td>
<td>(265)</td>
<td>(225)</td>
<td>(270)</td>
<td></td>
</tr>
</tbody>
</table>

---

1161.1 18.0292 17.005 7.5721 32.17 3.2708
1766.5 5.269 5.827 2.6936 1.6252 2.197
241 272 266 226 272 270
### Table 11. Pearsonian intercorrelation matrix for structural characteristics of organizations for India

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complexity</td>
<td>1.0000</td>
<td>-0.2477***</td>
<td>-0.0702</td>
<td>0.0518</td>
</tr>
<tr>
<td>2. Centralization</td>
<td>1.0000</td>
<td>0.0468</td>
<td>0.1443*</td>
<td></td>
</tr>
<tr>
<td>3. Diversification</td>
<td>1.0000</td>
<td>-0.1226</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Formalization</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the .05 level.

*** Significant at the .001 level.

### Table 12. Pearsonian intercorrelation matrix for structural characteristics of organizations, for USA

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complexity</td>
<td>1.0000</td>
<td>-0.1467**</td>
<td>0.0559</td>
<td>0.1407**</td>
</tr>
<tr>
<td>2. Centralization</td>
<td>1.0000</td>
<td>0.0117</td>
<td>0.0484</td>
<td></td>
</tr>
<tr>
<td>3. Diversification</td>
<td>1.0000</td>
<td></td>
<td>-0.1204*</td>
<td></td>
</tr>
<tr>
<td>4. Formalization</td>
<td>1.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Significant at the .05 level.

** Significant at the .01 level.
significant at the .001 level \( (r = -.2477) \) for India; and, at the .01 level \( (r = -.1467) \) for USA.

Hypothesis 2 is not supported for the USA \( (r = .0484) \). It is, however, significant at the .05 level \( (r = .1443) \) for India. It is also interesting to note that for the USA, complexity and formalization are positively related and significant at the .01 level; and, diversification and formalization are negatively related and significant at the .05 level.

**Structural-goal configuration of organizations**

Since the primary concern of this study is the relationship between, and the effect of, structural characteristics on various goal areas of organizations, the following hypotheses were of special interest. Tables 13 and 14 show zero-order correlation for the scales assessing the relationship among structural organizational attributes and goal areas.

3. The greater the centralization, the greater the production. This hypothesis is not supported for either country in terms of science or reading comprehension scores (India: Science: \( r = -.0482 \); Reading Comprehension: \( r = -.0468 \); USA: Science: \( r = -.0582 \); Reading Comprehension: \( r = -.1239 \)). It is negatively related and significant, however, at the .05 level for the USA. This would suggest that this hypothesis needs examination in terms of theory and measurement and testing in additional cultures and studies.
Table 13. Pearsonian intercorrelation matrix for structural-goal relationships of organizations for India

<table>
<thead>
<tr>
<th></th>
<th>Complexity</th>
<th>Centralization</th>
<th>Diversification</th>
<th>Formalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>-.0060</td>
<td>.0927</td>
<td>.0584</td>
<td>.0382</td>
</tr>
<tr>
<td>Adaptation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>.1788*</td>
<td>-.1792*</td>
<td>.0118</td>
<td>-.0758</td>
</tr>
<tr>
<td>Student</td>
<td>.1573**</td>
<td>-.0445</td>
<td>-.0645</td>
<td>.0033</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>.0948</td>
<td>-.0482</td>
<td>-.0059</td>
<td>.0347</td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td>.0399</td>
<td>-.0468</td>
<td>-.0931</td>
<td>.0381</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>.0433</td>
<td>-.0727</td>
<td>-.0665</td>
<td>.0383</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

**Significant at the .01 level.
Table 14. Pearsonian intercorrelation matrix for structural-goal relationships of organizations for USA

<table>
<thead>
<tr>
<th></th>
<th>Complexity</th>
<th>Centralization</th>
<th>Diversification</th>
<th>Formalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>-.0791</td>
<td>-.0317</td>
<td>-.0166</td>
<td>-.0265</td>
</tr>
<tr>
<td>Adaptation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>.3010***</td>
<td>-.3499***</td>
<td>.0045</td>
<td>.0040</td>
</tr>
<tr>
<td>Student</td>
<td>.0739</td>
<td>.0116</td>
<td>.0566</td>
<td>.1482**</td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>-.0750</td>
<td>-.0582</td>
<td>.0704</td>
<td>-.1955***</td>
</tr>
<tr>
<td>Reading Comprehension</td>
<td>-.0829</td>
<td>-.1239*</td>
<td>.1156*</td>
<td>-.2050***</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>.0268</td>
<td>.0657</td>
<td>.1044*</td>
<td>.0774</td>
</tr>
</tbody>
</table>

* Significant at the .05 level.
** Significant at the .01 level.
*** Significant at the .001 level.
4. The greater the Formalization, the greater the Efficiency. This hypothesis is not supported for either country (India: $r = 0.0382$; USA: $r = -0.0265$). Not only is it not significant, but the direction the relationship is unclear.

5. The greater the Formalization, the lower the Adaptation. This hypothesis is not supported for India (School Adaptation: $r = -0.0758$; Student Adaptation: $r = 0.0033$). As theoretically stated, it is not supported for the USA (School Adaptation: $r = 0.0040$; Student Adaptation: $r = 0.1482$). It is significant at the .01 level in the opposite direction from that which was predicted in regards to Formalization and Student Adaptation. This would suggest that this hypothesis needs further examination in terms of theory and measurement and testing in additional cultures and studies.

6. The greater the Centralization, the lower the Adaptation. This hypothesis is supported for both India ($r = -0.1792$) and the USA ($r = -0.3499$) at the .05 and .001 level respectively when considering the relationship between Centralization and School Adaptation. It is not supported, however, when considering Student Adaptation (India: $r = -0.0445$; USA: $r = 0.0116$). Furthermore, the direction is opposite for the USA.

7. The greater the Complexity, the greater the Adaptation. This hypothesis is supported for both School Adaptation ($r = 0.1788$, $N = 131$) and Student Adaptation ($r = 0.1573$,
N = 178) at the .05 and .01 level respectively for India. It is supported at the .001 level (r = .3010) for the USA when considering School Adaptation on its own (Student = .0739).

8. The greater the Diversification, the greater the Adaptation. This hypothesis is not supported for either country (India: School = .0118; Student = -.0645; USA: School = .0045; Student = .0566), although the direction is consistent with the theoretical relationship in all except that between Diversification and Student Adaptation for India.

9. The greater the Diversification, the greater the Satisfaction.

This hypothesis is supported for the USA at the .05 level (r = .1044); it is, however, negatively related and non-significant for India (r = -.0665).

Theory Testing

The model testing is to be accomplished by path analysis. With this method it is possible to determine if a pattern of correlations for a set of observations is consistent with the theory. The objective of path analysis is to compare the relationships that are presumed to hold between several variables to the observed data in the study (Kerlinger and Pedhazur, 1973). If the fit between the model to the data is close, the model is retained. If, on the other hand, the fit is not close, a new model may be devised or the old one will
be modified to better fit the data and then subjected to further testing.

The assumptions of path analysis are basic to those of multiple regression, plus two others:

1. Independent variables are related in a linear fashion with the dependent variable and among themselves.
2. Effects of independent variables can be added together to yield a prediction of the dependent variable.
3. Independent variables are not highly intercorrelated.
4. All variables are interval-level variables.
5. The dependent variable is normally distributed within categories of independent variables, singly and in combination.
6. The variance in the dependent variable is equal across categories of the independent variable.
7. The theoretical ordering of independent and dependent variables should be known and such that independent variables change first and dependent variables later.
8. The set of independent and dependent variables should be inclusive of all (major) variables influencing the dependent variables. That is, it should be a closed system.
9. Measures should have high (demonstrated) reliability and validity.
10. Disturbance terms (error terms) should be uncorrelated with each other or with independent variables directly connected to the same variable (Lcether and McTavish, 1974:308).

It is assumed in this study that some of the essential elements of the model have been identified theoretically, correctly measured empirically, and therefore, suitable for theory testing.

Tables 15 and 16 show the standardized partial regression coefficients from the regression of each organizational attribute of schools on goal areas for India and the USA, while Figures Figures 3 and 4 fit the empirical findings to
Table 15. Standardized partial regression coefficients from regression of each structural characteristic on goal areas: India

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Efficiency</th>
<th>Production</th>
<th>Adaptation</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Science</td>
<td>Reading</td>
<td>School</td>
</tr>
<tr>
<td>Complexity</td>
<td>.01884</td>
<td>.08529</td>
<td>.02173</td>
<td>.15022</td>
</tr>
<tr>
<td>Centralization</td>
<td>.09006</td>
<td>-.03253</td>
<td>-.04215</td>
<td>-.13407</td>
</tr>
<tr>
<td>Formalization</td>
<td>.03149</td>
<td>.03575</td>
<td>.03255</td>
<td>-.06169</td>
</tr>
<tr>
<td>Diversification</td>
<td>.05932</td>
<td>.00598</td>
<td>-.08565</td>
<td>.02103</td>
</tr>
<tr>
<td>Multiple R</td>
<td>.11358</td>
<td>.10421</td>
<td>.10980</td>
<td>.23623</td>
</tr>
<tr>
<td>R²</td>
<td>.01290</td>
<td>.01086</td>
<td>.01206</td>
<td>.05581</td>
</tr>
</tbody>
</table>
Table 16. Standardized partial regression coefficients from regression of each structural characteristic on goal areas: USA

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Efficiency</th>
<th>Production</th>
<th>Adaptation</th>
<th>Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Science</td>
<td>Reading</td>
<td>School</td>
</tr>
<tr>
<td>Complexity</td>
<td>-.08275</td>
<td>-.06189</td>
<td>-.08296</td>
<td>.25817**</td>
</tr>
<tr>
<td>Centralization</td>
<td>-.04314</td>
<td>-.05940</td>
<td>-.12891*</td>
<td>-.31142**</td>
</tr>
<tr>
<td>Formalization</td>
<td>-.01445</td>
<td>-.17789**</td>
<td>-.17513**</td>
<td>-.01844</td>
</tr>
<tr>
<td>Diversification</td>
<td>-.01322</td>
<td>.05278</td>
<td>.10048</td>
<td>-.00853</td>
</tr>
<tr>
<td>Multiple R</td>
<td>.09234</td>
<td>.21596</td>
<td>.26527</td>
<td>.43207</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.00853</td>
<td>.04664</td>
<td>.07037*</td>
<td>.18669**</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.

**Significant at the .01 level.
*Not in direction posited.

Figure 3. Final path model based on theoretical India and measurement models
Figure 4. Final path model based on theoretical USA and measurement models.

Not in direction posited.
the theoretical relationships.

Standardized partial regression coefficients are obtained from the equation:

\[ X_a = \beta_{ab}X_b + \beta_{ac}X_c + \beta_{ad}X_d + \beta_{ae}X_e + \beta_rX_r \]

where \( X_a \) is the school mean score of a specific goal area, \( X_b \) through \( X_e \) are the four measures of the organizational attributes of schools, and \( X_r \) is the residual term.

In order to calculate the path coefficients for the causal model presented in Figure 4 it is necessary to do twelve regression analyses. Each variable \( a \) is regressed on variables \( b, c, d, \) and \( e \) to obtain \( \beta_{ab}cde = \beta_{ab}; \beta_{ac}bde = \beta_{ac}; \beta_{ad}bce = \beta_{ad}; \) and, \( \beta_{ae}bcd = \beta_{ae} \) for each country.

Results of Multivariate Analysis

Tables 15 and 16 show only two of the 12 predicted multiple regression equations have a total explained variation which is significant at the .05 and .01 level. These provide an estimate of the proportion of variation in the dependent variable explained by the linear combination of Complexity, Centralization, Formalization, and Diversification. For the USA sample, 7% of the variance in Reading Achievement and 19% of the variance in School Adaptation is explained by the linear combination of the independent variables. Thus, the model leaves 81% of the variation in School Adaptation and 93% of
the variation in Reading Achievement "unexplained." A most unsatisfactory situation. The path coefficients for the paths between Centralization and School Adaptation \( (p = -0.311) \) and between Complexity and School Adaptation \( (p = 0.261) \) are moderately acceptable and should be retained for any further testing.

Individual variables within some of the multiple regression equations were found significant for the USA sample, but not always as predicted from the theoretical model. The theoretical model (see Chapter 2) predicted a positive relationship between Centralization and Production (both Science and Reading Achievement Scores) while the data show a significant \( (p = -0.128, \alpha = 0.05) \) negative relationship between Centralization and Reading Achievement. Science scores were also negatively related \( (p = -0.059) \) but nonsignificant. The theoretical model made no predictions regarding the effect of Formalization on Production, yet the data show a significant negative relationship between the two for both Science \( (p = -0.178, \alpha = 0.01) \) and Reading Achievement \( (p = -0.175, \alpha = 0.01) \) scores. This would suggest that a revision of the model should include this variable as a predictor of Production.

In terms of adaptation, the theoretical model predicted a positive relationship between adaptation (school and student) and complexity and the data supported this prediction \( (p = 0.258, \alpha = 0.01) \) with regard to School Adaptation. Student
Adaptation was a positively related but nonsignificant. The model also predicted a negative relationship between adaptation and Centralization and the data supports this for School Adaptation ($p = -.311, \alpha = .01$) but not Student Adaptation ($p = .008$). Formalization was expected to have a negative effect on adaptation (both student and school), but the data did not support this. Student Adaptation ($p = .148, \alpha = .05$) has a positive effect on adaptation when combined with the other independent variables.

To sum, the findings in this study regarding bivariate and multiple relationships among organizational attributes of schools and their goal areas are meager, but nonetheless significant. Only two bivariate hypotheses were supported for both India and the USA. They were those related to Complexity and Centralization, as well as, Centralization and School Adaptation. For these support was obtained for:

The greater the Complexity, the lower the Centralization.

The greater the Centralization, the lower the School Adaptation.

It must be noted, however, this relationship was not supported when considering the effect of Centralization on Student Adaptation.

Two hypotheses were significant for the Indian sample only. They were:
The greater the Centralization, the greater the Formalization.

The greater the Complexity, the greater the Adaptation.

One hypothesis was supported as theoretically predicted for the USA sample. And, that was:

The greater the Diversification, the greater the Satisfaction.

No hypothesized relations were posited between Complexity and Formalization, between Diversification and Formalization, nor between Production and Formalization. They were, however, found to be correlated in the USA sample in the following manner:

The greater the Complexity, the greater the Formalization.

The greater the Formalization, the lower the Diversification.

The greater the Formalization, the lower the Production.

Two hypotheses were found to be significantly related in the opposite direction from that which was predicted. These hypotheses are:

The greater the Centralization, the lower the Production.¹

The greater the Formalization, the greater the Student Adaptation.¹

¹Found to be statistically significant for the USA.
When considering the multiple effects of attributes of school organization on goal areas, no conclusive results can be specified for India. On the other hand, for the USA sample, when controlling on all other factors, Complexity is positively related to School Adaptation while Centralization is negatively related to it. The relationship between Centralization and Science and Reading Achievement scores were also found to be negatively related when controlling on all other organizational attributes. Finally, the relationships between Formalization and Student Adaptation, Science and Reading Achievement were inversely related when all other attributes were controlled.

Although the results of the multivariate analysis for India were weak and nonsignificant (the largest $R^2$ was 6% explained variation in School Adaptation), bivariate analyses did support some interesting hypotheses related to education in developing countries and the identification of possible indicators which would aid policy makers in developing (and developed) countries. The next chapter will discuss implications of these findings for the development of such indicators, as well as, implications for further organizational theory development.
CHAPTER 5: IMPLICATIONS

In Chapter 1, five objectives of this dissertation were stated. They were: (1) to inductively and deductively identify goal areas of the educational system; (2) to develop output descriptive indicators; (3) to identify a relevant theoretical model which specifies several goal areas and the structural means to achieve them; (4) to develop and test a social indicator model which contains both output descriptive indicators and analytic indicators; and, (5) to evaluate the model in terms of its contribution to social indicator construction and analysis as well as its utility for policy formation. It is the objective of this chapter to discuss dissertation objective 5 using the discussion and findings from the previous four.

In order to make sociological knowledge more relevant to policy formation, this study has tried to apply a sociological theory directly to problems of social policy. By drawing upon theory and research related to complex organizations, specific hypotheses were derived and interrelated into a model to explain concrete social processes related to educational development. From a grounded approach, four goal areas of the educational system were identified. They were: Production, Satisfaction, Efficiency, and Adaptation. These were identified as output descriptive indicators. Four structural factors which have been shown in the literature to be related to these goal areas were identified as Centralization, Complexity,
Formalization, and Diversification. These were identified as manipulable indicators. Finally, relating the four structural manipulable indicators to the four output descriptive indicators, we have a model or system of relationships which identify analytic indicators of the social processes specified in the model. Although this is a cross-sectional study, a conceptual and theoretical basis has been developed for future time series studies. Particularly, further studies by IEA would be very beneficial for social indicator construction in all participating countries. The concepts which have been developed in this study and their relationships could be improved upon by further comparative analysis and thus provide an integrated approach to the concerns of social planning.

Therefore, the approach in this study was basically that of deduction in which the first step is to identify theoretically those abstractions from reality which are believed to be the most relevant to the problem. Then a social indicator model was developed, based on such theory, and composed of both output descriptive and analytic indicators. Until recently, the analytic indicator category was only implicit until it was identified by Land (1971). Land suggested that in addition to the disaggregation and time-series criteria, a social indicator must also be identified as a component in a social indicator model. "Thus, for any particular social condition, social indicators are specified when some conception of the relevant
Policy Implications

The development of a social indicator model is valuable to policy concerns for three reasons (Land, 1972:21). For any educational condition, it is useful to identify which output descriptive and analytic indicators are involved. Second, the actual relationship between indicators are specified in the model and this facilitates a decomposition of changes in the output descriptive indicators to those due to changes in other indicators, those due to random disturbances, and those due to changes in the relationships of the output descriptive indicators to other indicators. Such changes in the indicator relationships may be as important as the changes in the output descriptive indicators themselves. And, according to Land, since these indicators have been purged of the purely random variation which occurs in direct observations on output indicators, analytic indicators may be more basic indices of the underlying social condition being measured. Finally, the position of the indicator within the social indicator model may be important in determining its construct validity. Even though an indicator may be defined in a most logical and precise manner, the researcher must still provide evidence that
the indicator measures what it is supposed to measure. Although studying an indicator in its relationship to other variables within a social indicator model is one way of making construct validation, it will not provide indisputable evidence on its construct validity. It can, however, relate information concerning how one indicator behaves with respect to other indicators.

Methodological Implications

A major methodological consideration is the development of operationalized concepts which are relevant cross-nationally. This study has assumed that this was achieved. Realistically, one must concede that this assumption may not be valid, particularly in the area of operationalizing "educational quality."

The fact that little support was given for the path model (no support for the Indian sample) does not necessarily mean that those selected aspects of reality are not relevant. Other factors may be operating, such as, poor measurement, measurement error, incorrect specification of the ordering of variables, and missing data on variables. For example, there are some correlations based on data which has over 40% of the cases missing.

The original intention of this dissertation was to test the model utilizing data from seven countries instead of two.
Financial difficulties, however, made this impossible. Certainly, the study would have been more profitable for social indicator research, theoretical and methodological advancement if such an undertaking could have been managed. Further research along these lines would be desirable.
CHAPTER 6: SUMMARY

This study, an outgrowth and continuation of previous development in the design of a social indicator monitoring system (see especially, Wilcox, McIntosh, and Callaghan, 1974) addresses the theoretical problems involved in developing an educational information system. The major objective was to relate some of the objectives of social indicators to sociological distinctions and theory. The primary reason for so doing was due to the lack of a social theory which would provide guidelines for the collection of relevant indicators.

Education, a component of social development, was chosen for analysis because virtually all of the research related to the development of social indicators identifies education as a primary area of concern and is considered one of the most essential factors which influences economic growth. Specifically, educational concerns in the Third World were identified. They were seen as a historic conjunction of an increase in the number of pupils, an acute scarcity of resources, rising costs and the inability of the educational system to adapt to a changing environment. This study was particularly interested in the ability or the inability of the educational system to adapt to a changing environment (although other concerns were also addressed and are to be summarized later). The ability to adapt was conceptualized as "educational quality."
"qualitative" aspect of education was defined generally as:

1. an education which is related closely and meaningfully to the life, needs, and aspirations of individuals living in a changing society.

2. an education which is life-long.

3. an education which emphasizes the ability to think or the development of a "critical consciousness" which stresses problem solving, and flexibility in thought and in learning strategies rather than that which emphasizes acquired knowledge.

It was felt that prospects for improving the educational information system so that it would be usable by the policymaker to assess the quality (as well as other concerns) of education depends largely upon the ability to incorporate and utilize theory and research aimed at the development of more adequate knowledge of educational phenomena. To this end, it seemed essential to identify existing theory and conceptual frameworks pertaining to that problem and then pinpoint a set of indicators which bear directly, and specifically, on the factors that pertain to the practical difficulties of decision making. Land (1972) suggests that from such theory a social indicator model must be developed and composed of two basic types of indicators: output descriptive and analytic indicators.

From this research problem, the following objectives were pursued:
1. to inductively and deductively identify goal areas of the educational system.

2. to develop output descriptive indicators

3. to identify a relevant theoretical model which specifies several goal areas and the structural means to achieve them.

4. to develop and test a social indicator model which contains both output descriptive indicators and analytic indicators.

5. to evaluate the model in terms of its contribution to social indicator construction and analysis as well as its utility for policy formation.

From the grounded approach, four goal areas were identified: Production, Satisfaction, Efficiency, and Adaptation. Theory and research, largely derived from Aiken and Hage, identified significant organizational attributes as they affect these various goal areas. The four organizational attributes were: Complexity, Centralization, Formalization, and Diversification.

It was theorized that certain structural attributes or organizations, either directly or in combination with others, affect goal achievement. The following hypotheses based on previous research related to this issue were derived:
1. The higher the Complexity, the lower the Centralization.

2. The greater the Centralization, the greater the Formalization.

3. The greater the Centralization, the greater the Production.

4. The greater the Formalization, the greater the Efficiency.

5. The greater the Formalization, the lower the Adaptation.

7. The greater the Complexity, the greater the Adaptation.

8. The greater the Diversity, the greater the Adaptation.

9. The greater the Diversity, the greater the Satisfaction.

In addition to these bivariate hypotheses, a causal model was developed to test the combined effect of organizational attributes on goal effectiveness.

The findings were reported from statistical analysis using correlation and multiples regression methods. The following hypotheses were supported:

1. The greater the Complexity, the lower the Centralization.
2. The greater the Centralization, the lower the School Adaptation.

3. The greater the Centralization, the greater the Formalization.

4. The greater the Complexity, the greater the Adaptation.

5. The greater the Diversification, the greater the Satisfaction.

Two hypotheses contradicted previous research:

6. The greater the Centralization, the lower the Production.

7. The greater the Formalization, the greater the Student Adaptation.

And, three new hypotheses were developed:

8. The greater the Complexity, the greater the Formalization.

9. The greater the Formalization, the lower the Diversification.

10. The greater the Formalization, the lower the Production.

When considering the multiple effects of attributes of school organization on goal areas, no conclusive results were specified for the Indian sample. On the other hand, for the USA sample, when controlling on all other factors, Complexity was positively related to School Adaptation while Centraliza-
tion was negatively related to it. The relationship between Centralization and Science and Reading scores were also found to be negatively related when controlling on all other organizational attributes. Finally, the relationships between Formalization and Student Adaptation, Science and Reading Achievement were inversely related when all other attributes were controlled. Although the results of the multivariate analysis for India were weak and nonsignificant (the largest $R^2$ was 6% explained variation in School Adaptation), bivariate analyses did support some interesting hypotheses related to education in developing countries and the identification of possible indicators which would aid policy makers in developing countries.

Perhaps the most significant finding of this study supports the hypothesis developed by Hage, related to the adaptation of complex organizations; and, that developed by Beeby, related to the development of educational quality in developing countries. This study found that Complexity, or the number of occupation which require specialized knowledge, was positively related to Adaptation or educational quality for both India and the United States.
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Thompson, Victor  

Thorndike, Robert L.  

Turner, Jonathan H.  


United Nations Educational, Scientific, and Cultural Organization


United Nations Educational, Scientific, and Cultural Organization, UNESCO


Waller, Willard


Weber, Max


Webber, M. M.


Wilcox, Leslie D., Wm. Alex McIntosh, and John Callaghan

Wilson, James Q.

World Bank, International Development Association

Yuchtman, Ephraim
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I have a great deal of admiration for my son and daughter, Randy and Jocelyn Hunter, who are developing into fine people despite nearly total neglect from their mother for the past four years. My mother, Eva, and my father, Louis, Bob Hunter, and Joan Christianson provided loving childcare during the times of great need.

Either in body or spirit, my nearly constant companion, John Callaghan, has provided emotional, intellectual, and
financial support during these past four years. Nothing can be said which would convey the importance that friendship has meant to me.
1. Instructions for all questionnaires should encourage all respondents to give a response to every item (except items 28-59 in the Teacher Mother Tongue questionnaire which M.T. teachers not teaching literature should omit). It is left to National Centers to frame the statement for their own countries. Indeed, test administration and school co-ordinators should be asked by National Centers to ensure that all questionnaire items are completed.

2. Obviously greater freedom is permissible in the translation of questionnaire items than in test items. In some instances items will have to be completely adapted for national use. However, where an international code has been provided, it is essential that the information is obtained nationally in such a way that the international coding can be applied.

3. In the stem of most questions the word "indicate" has been used. Where the National Center has decided to use an MRC answer card, the stem will have to be changed to read something like "indicate by blackening in the appropriate space on the answer card". Where punch cards will be returned by a National Center, their stem should be changed to something like "indicate by circling
the appropriate letter below".

4. All questions in which the response indicates the grouping of a continuous variable, a short-hand convention using the signs \( \geq \) (less than or equal to) and \( < \) (greater than) has been used. National Centers should translate these signs into appropriate words for the respondents to the questionnaires. The convention has been used for the sake of accuracy.

5. Wherever Mother Tongue is printed in parentheses, the actual Mother Tongue should be inserted.

6. Where appropriate, national examples should be given in order to help respondents answer the questions accurately.

7. **Unscaled Variables.** Where it has been difficult to evolve an international scale which adequately represents different practices in participating countries, the variable has been designated as an international unscaled variable. National Centers are asked to formulate for each of these variables up to a nine-point scale which will be appropriate for use within their country and which agrees with the general outline provided in the specific accompanying notes. The purpose of this outline is to ensure a certain uniformity of categorisation between the different countries, that is, all countries should collect data on the same dimension and ordered in the same way. It is important that National
Centers transmit copies of their classificatory schemes to the IEA International.

8. In order to secure the most accurate information to questionnaire items, countries may wish to consider assigning several of the items as 'home tasks' for the student. Students would be asked to find out the answers to several of the items in preparation for completing the questionnaire. Such items which could profitably be assigned as 'home tasks' include: Father's Occupation and Father's and Mother's Education.

9. In a number of countries, students will require some guidance from teachers in answering questionnaire items. Such guidance is appropriate and desirable. It is quite possible that, in some situations, teachers will read questionnaire items aloud, discuss points of clarification, allow time for students to supply an answer and proceed to the next item. Such a step by step approach to the completion of the student questionnaire may be necessary at the 10-year-old level in various countries where students have had little or no experience with questionnaires. Where students may be expected to give the same answer (e.g., number of students in class, grade student is in etc.) the best procedure is for the teacher to supply the answer and get all students to enter it in. It is, of course, clear that no help will be given to
students when answering the tests (as opposed to the questionnaires).

10. Where students are requested to give a quantitative response to an item, e.g. number of hours of homework, these are to be coded to the nearest whole hour, year, etc.

11. Where a response of zero or none is given to the questionnaire item, this is to be coded 0 on the punch card. Where an individual has failed to record a questionnaire item, the appropriate column should be left blank. The distinction between a blank and a zero is an important one.

12. Wherever coding or punching schemes are being used in the coding of responses, minimum and maximum values for each variable are set forth in the international coding scheme. Where a student indicates a response which is greater than the maximum value, it is to be coded as the maximum value. Thus, if the maximum value for a certain variable is 25, a response of 30 would be coded as 25, since 25 means 25 or more.
SCHOOL QUESTIONNAIRE
SCHOOL QUESTIONNAIRE

Accompanying Notes

Note: Each school will require 3 punched cards A, B, C. If more than one population is tested in any one school, then leave column 8 blank.

Q.6 Community or area in which the school is situated.
National Centers should, if they define the categories in more precise terms, send in their definitions to IEA International. Please note (see Mathematics Study) that it is unwise to classify by size of community. Rather the classification should be in terms of rural (country areas) and urban (heavily built up).

Q.7 Available in the sense of being able to visit.

Q.9 This question will have to be rephrased according to the national system of education. When punching, 01 will be the first year of school after kindergarten, 02 the second year, etc.

Q.10-11 Target population should be expressed in terms of the national school system.

Q.16 The aim of this question is to determine the extent to which operating (capital and recurrent) costs are provided by the government or by private sources. The phrase 'or almost wholly' is to allow for those small amounts provided by other sources.
Q.17 It is recognized that the type of detailed financial information requested in this question is sometimes difficult to obtain accurately. However, it is important that as good estimates as possible are entered. It may be that the National Center will have to have careful estimates made either by themselves or the school principal. Alternatively, the information will have to be collected from the local authority. Amounts should be coded in the national currency. Use the appropriate number of columns and inform IEA International of what you have done. (Factors x 10 or x 100 can be introduced).

Q.18 It is important that part-time teachers are counted. It is up to National Centers to agree with the participating schools on the equivalence of part-time teachers to one full-time teacher. Laboratory Technician: This may have to be defined in national terms. What is intended is a person (not a student) who can assist with the setting up of experiments and helping with demonstrations in the laboratory. Aide or Ancillary Teacher: These persons are defined as assistants (not qualified teachers) to teachers in carrying out instruction.

Q.23 Some schools have a particular emphasis, such as mainly academic or mainly vocational, etc. Other schools
provide explicitly all types of course without particular preference or emphasis on any of them. The National Centers may have to rephrase this question in a way appropriate for their particular country, but it must be coded in terms of the international code.

Q.24 "Language of instruction of school". This is remedial teaching to those foreign children (primarily immigrants) who are attending the school.

Q.26 The interest here is in whether or not there is any student participation at all in decisions concerning discipline, not in the degree to which it occurs.

Q.29 In most schools there is usually a grade level after which certain subjects become optional. The aim of this question is to determine that point.

Q.31 This should also include 'parent associations' or similar activities.

Q.31 c) Activities for raising money for school irrespective of whether this money is to be used for sports facilities or new equipment etc., for school.

N.B. School Region Classification Column C/40

No question has been asked on the questionnaire but it is important that each school is classified according to the percentage of the labour force in its "region" engaged in agriculture, forestry and fishing. It will be necessary for the National Center to have an economic
SCHOOL QUESTIONNAIRE

(Note - It is assumed that this questionnaire will be completed by the school co-ordinator who may or may not be the school principle.)

The present questionnaire is devised to provide information needed for an international study of three subject areas. Among other things, outcomes of instruction in terms of performance on international achievement tests are related to certain "input" factors such as the facilities of the various school systems in terms of teacher training, number of hours of instruction, physical plant, etc. We are fully aware of the fact that in some instances a question cannot be answered with complete accuracy unless the school co-ordinator carries out time-consuming research. We want, however, to avoid that an undue burden is put on those answering the questionnaire, and therefore, urge that estimates are made in cases when exact figures are not available.
geographer or demographer carry out this classification. The National Technical Officer should furnish the economic geographer with a list of the names and addresses of every school in the sample. The economic geographer must first of all determine the "region" of the school. The "region" is defined as the area within half a days' travel time of the school in all directions by the most commonly used means of surface transportation. Once the "region" is established, the economic geographer will have to code the school according to the following scheme.

Percentage of labour force engaged in agriculture, forestry and fishing.

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 9</td>
<td>1</td>
</tr>
<tr>
<td>10 - 25</td>
<td>2</td>
</tr>
<tr>
<td>26 - 50</td>
<td>3</td>
</tr>
<tr>
<td>51 - 75</td>
<td>4</td>
</tr>
<tr>
<td>over 76</td>
<td>5</td>
</tr>
</tbody>
</table>
SCHOOL QUESTIONNAIRE

Country

1. Name of School_________________________________________

Target Population

Personal Data of School Principal

2. Please indicate your formal qualifications.  
   (indicate highest degree received)
   Less than Bachelors  __________________________
   Bachelor  __________________________
   Masters  __________________________
   Doctorate  __________________________

3. How many years have you served as a school principal altogether?  ___________ years

4. How many years have you served as a principal of this school?  ___________ years

5. How many years teaching experience have you had altogether?  ___________ years

Basic School Facts

6. Which of the following characterize the community served by your school?
   (check where appropriate)
   Urban  ___________
   Suburban  ___________
   Rural  ___________
7. Which of the following amenities are available for students at your school to visit or join? (Indicate once in each row)

<table>
<thead>
<tr>
<th></th>
<th>In local vicinity (less than 30 minutes travel)</th>
<th>In a neighbouring town (can be reached in less than 2 hours)</th>
<th>Not readily available for your students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Museum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Library</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concert Hall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opera/Theatre/Ballet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign language societies/cultural organization/information center</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. What is the total enrollment of full-time students in your school?

Boys 

Girls
9. What is the lowest and what is the highest grade in this school?

Lowest

Highest

10. Approximately how many students are there in the grade in which most 10 year olds are to be found

in which most 14 year olds are to be found

which is the pre-university grade

11. For each of the following grades, indicate the one designation which best describes your school. (Indicate once in each row)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade does not exist in school</th>
<th>Boys only</th>
<th>Girls only</th>
<th>Boys and Girls mainly taught together</th>
<th>Boys and Girls mainly taught separately</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade in which most 10-year-olds are to be found</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade in which most 14-year-olds are to be found</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-university grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. Does your school have: (indicate one)
   Day students only
   Some day students and some boarding students
   Boarding students only

13. How many students, on the average, are accommodated in a laboratory for a practical science lesson?

POPULATION II
   0
   1-10
   11-20
   21-30
   31 or more

POPULATION IV
   0
   1-10
   11-20
   21-30
   31 or more
Administration

14a. By whom is the real decision made in following matters: (indicate wherever appropriate)

<table>
<thead>
<tr>
<th>Decision</th>
<th>Teacher or Subject Committee of teachers or faculty</th>
<th>Head of the school</th>
<th>Some local or central authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choosing textbooks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making rules and regulations for students in the school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choosing teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determining conditions of employment of teachers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Selecting students for entrance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deciding on major expenditure of money</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Determining size of tuition fees (if any)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14b. Which of the following body is the most important in determining the syllabus or content of subject courses:

(check one)

a. some outside education authority (e.g. State)

b. an external committee which contains teacher representation

c. an external committee which contains teacher representation from this school

d. the school
   (i) by the school principal
   (ii) by the head of each subject department
   (iii) by a committee of teachers of each subject
   (iv) by each individual teacher
   (v) by the faculty and students together
14c. Which of the following body is the most important in determining the methods of approach used in teaching (i.e. how the subject matter is taught): (check one)

a. some outside education authority (e.g. State) □

b. an external committee which contains teacher representation □

c. an external committee which contains teacher representation from this school □

d. the school
   (i) by the school principal □
   (ii) by the head of each subject department □
   (iii) by a committee of teachers of each subject □
   (iv) by each individual teacher □
   (v) by the faculty and students together □

15.i How frequently do inspectors (superintendents, supervisors, advisors, etc.) visit your school (indicate one)

Never □
Less than once a year □
Once a year □
Twice a year □
More than twice a year □
15.ii If you are visited by inspectors what is the purpose of their visits? (Indicate more than one where appropriate)

To prepare a report for the authorities

To advise on some of the problems of the school

To advise teachers

To assess teachers

16. Are the operating costs for your school: (indicate one)

Totally or almost wholly provided by the government (local or central)

Partially provided by the government (local or central)

Totally or almost wholly provided by private sources

17a. Please fill in the following concerning the annual budget for your school.

i) Teachers salaries

ii) Non-teaching staff salaries and wages

iii) Maintenance and repair

iv) Books, stationery etc.

v) Equipment materials, teaching aids etc.

vi) Other (e.g. loan charges)

17b. About what percentage of 17a (v) above is for science
Staff

18a. How many full-time and full-time equivalent (See Note) teachers are currently employed in your school? (including yourself if you teach)

No. of teachers

18b. What percentage of the teachers (full-time and full-time equivalent) in your school are men? _______ percent

18c. What percentage of the teachers (full-time and full-time equivalent) are teaching science? _______ percent

18d. What percentage of the teachers (full-time and full-time equivalent) are teaching aspects of Mother Tongue e.g. grammar, reading etc. at your school? _______ percent

19. How many of the following persons (full-time equivalent) provide a service in your school? (Round to the nearest whole number)

<table>
<thead>
<tr>
<th>Position</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Librarian</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laboratory Assistant or Technician</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Counselor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School Psychologist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading Specialist</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Worker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aide or Ancillary teacher</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Language Assistant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
20. Do you have available to your school any specialist service (e.g. a child guidance clinic or a school psychological service) to which students with reading difficulties can be referred?
Yes___________  No___________

Admission

21. What criteria, other than age, are used for the admission of students to your school? (Indicate where appropriate)
Residence in area near school
Performance in previous school or class
Interview
Entrance examination
Graduation from a particular course or school
Membership of a particular group (e.g. religion)
22. Dividing students into classes for purposes of instruction, in academic subjects, schools adopt various practices:

A. Fast learners and slow learners are taught together for all subjects.

B. Fast learners and slow learners are taught separately for all subjects.

C. Fast learners and slow learners are taught together for some subjects and are taught separately for other subjects.

Please indicate which policy is predominantly followed in your school.

A. ________

B. ________

C. ________

Note: If you find it difficult to choose one of these alternatives, please indicate why in the remarks section at the end of this questionnaire.

Educational Program

23a. Which of the following statements best characterizes your school’s program?

The school provides a variety of types of courses ______

The school provides only one type of course, (e.g. academic, commercial, etc.) ______

23b. If you indicated the second alternative in Q.23a, which type of course is provided:

Academic ______

Vocational/Technical ______

General ______
24. Do you have any provision for remedial teaching or tutoring in each of the following subject areas? 
(Indicate once in each row)

<table>
<thead>
<tr>
<th>Subject</th>
<th>None</th>
<th>In cases of great need only</th>
<th>Generally available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language of instruction of school</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

25. What is the language of instruction for most children in your school? (Indicate one)

- Mother Tongue of children  
- Another language

26. In your school is there student involvement in decision-making concerning disciplinary action? (Indicate one)

- Yes
- No
27. Which of the following types of student assessment are used in your school? (Indicate one in each row)

<table>
<thead>
<tr>
<th>Rarely or Sometimes</th>
<th>Frequently</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral examinations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher made essay tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher made objective tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardised tests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment of general performance in class</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

28a. On average how many hours schooling per week do students in your school receive? (Indicate where appropriate)

Population I ______________________ hours
Population II ______________________ hours
Population IV ______________________ hours

b. On average how many weeks schooling per year do students in your school receive? __________ weeks

29. After which grade do A) Science and B) Literature cease to be compulsory subjects?

A) Science __________ grade
B) Literature __________ grade
Concerning Science Teaching

30.i. In your school, is Science education best regarded as:
(indicate one)
a) embracing at least biology, chemistry and physics
   whether taught as an integrated discipline or not

b) an intensive study of one, or at the most two, of
   the separate branches of science

30.ii. If your answer to question 30.i is a) please indicate
       if it is usual in you school for a student to study two
       or more branches of science simultaneously or are the
       branches studied consecutively, for example, in yearly
       units?

       Simultaneously
       Consecutively

30.iii. If your answer to 30.i is a) please indicate at what
        point in your school science is separated into its major
        branches of biology, chemistry and physics.
        As an integrated discipline throughout
        As separate branches from about Population I
          onwards
        As separate branches from about Population II
          onwards
        As separate branches throughout
31a. Does your school have a parent-teacher association? (indicate one)

Yes

No

b. If yes, how frequently does it meet? (indicate one)

Once a year

Twice a year

Three to five times a year

Six or more times a year

c. If yes, in which of the following activities does it engage? (indicate where appropriate)

Social work in the community

Socio-cultural activities

Activities for raising money for school

Curriculum and instructional methods (Cooperation over pupils learning problems)

Parent education - providing information for parents about various aspects of the school program
School Principal's Remarks
TEACHER QUESTIONNAIRE
"Population of Teachers to Whom Teacher Questionnaires should Be Given"

Population I

All classroom teachers in selected schools who are teaching students aged 10-11 or younger. In large schools a sub-sample of this population of teachers can be taken. All selected teachers should be requested to complete the General Section of the questionnaire; if any are teaching science (in any form) they should be asked to complete the Science section; if any are also specific teachers of reading, they should be asked to complete the Mother Tongue section.

Population II and IV

All teachers in selected schools who are teaching Science, (and Mother Tongue for countries testing in Reading Comprehension and/or Literature). All selected teachers should be requested to complete the General Section of the questionnaire; in addition, science teachers should be asked to complete the science section and Mother Tongue teachers, the Mother Tongue section.
General Section

Q.3 The term 'university degree level' means B.A./B.Sc. level.

Q.7 This is full-time training and such phenomena as "Referendarizeit" in Germany should be included. The term 'excluding part-repetition of courses' refers to repeating a year in a higher education course. Thus, if it has taken a teacher 4 years to complete what is normally a 3 year course this should be recorded as 3 years.

Q.12 By general teachers' association or union is meant either regional or national association e.g., National Education Association, American Federation of Teachers, N.U.T. etc.

Q.28 The term 'printed drill material' includes both work books and other books which comprise primarily many routine exercises.

Q.38 This should be treated as an unscaled variable. National Centers should develop a set of up to nine categories which will cover the range of possible circumstances in their country. The categories should be arranged in order of their position in the academic hierarchy (if possible).

Category A will be "I have received no training at all".
Categories B, C and D should be used for institutions which do not give degrees.
Categories E, F and G should be used for institutions giving first degrees but not allowing for graduate
study.
Categories H, I and J should be reserved for university type institutions.
See the General Notes for further explanation of unscaled variables.

**Science**

Q.1-5 If the word "semester" is not used, replace with "year" or "term" whichever is appropriate. However the question should be asked in such a way that the international coding can be used on the answer card. Where, for example, in physics both a laboratory and lecture class have been taken in a semester, this is one semester.

Q.6-10 This may be rephrased into hours or days in some countries where appropriate, but must be coded in terms of the international code.

**Mother Tongue**

The Dry Run Teacher Reading Comprehension and Literature Questionnaires have been collapsed into one Teacher Mother Tongue Questionnaire. All Mother Tongue teachers should answer Qs. 1-27 and only Literature Teachers should then continue with Qs. 28-59.

Q.2-6 These may be rephrased into hours or days in some countries where appropriate, but code in terms of the international code. (6 hours = 1 day; 5 days = 1 week)
TEACHER QUESTIONNAIRE

GENERAL SECTION

Please record the answers to the following questions in the appropriate place in section AA on the answer card. The responses should be made by blackening the chosen response position with an ordinary pencil. Please give only one response to each question and erase all stray marks.

1. Sex  (indicate one)
   A. Male
   B. Female

2. Age  (indicate one of the following)
   A. 27 or younger
   B. 28 - 37
   C. 38 - 47
   D. 48 - 57
   E. 58 or more

3. Are you a specialist teacher with training to University degree level in Science or Mother Tongue?
   A. Yes, in Science
   B. Yes, in Mother Tongue
   C. No, but have a degree in some other subject(s)
   D. No degree

4. If yes, are you now teaching
   A. your special subject(s) only?
   B. your special subject(s) and one or two other subjects?
   C. only subject(s) other than those for which you were trained to teach?
5. If no, are you teaching
   A. a single subject?
   B. two or three subjects?
   C. most of the subjects in the curriculum?

6. Indicate how many years of full-time education (primary and secondary only) you have had.
   A. < 6
   B. > 6 ≤ 8
   C. > 8 ≤ 10
   D. > 10 ≤ 12
   E. > 12

7. Indicate how many years of full-time education you have had beyond secondary school (excluding part-repetition of courses).
   A. 0 years
   B. > 0 ≤ 2
   C. > 2 ≤ 3
   D. > 3 ≤ 4
   E. > 4

8. Indicate how many years, including the present year, you have been teaching altogether.
   A. ≤ 5 years
   B. > 5 ≤ 10 years
   C. > 10 ≤ 20 years
   D. > 20 ≤ 30 years
   E. > 30 years

9. Indicate how many years, including the present year, you have been teaching altogether in this school.
   A. ≤ 5 years
   B. > 5 ≤ 10 years
   C. > 10 ≤ 20 years
   D. > 20 ≤ 30 years
   E. > 30 years

10. Indicate how many hours a week you spend in preparing lessons.
    A. ≤ 3 hours
    B. > 3 ≤ 6 hours
    C. > 6 ≤ 10 hours
    D. > 10 ≤ 15 hours
    E. > 15 hours
11. Indicate how many hours a week you spend on marking papers and examinations.
   A. < 3 hours   B. > 3 ≤ 6 hours   C. >6 ≤ 10 hours
   D. > 10 ≤ 15 hours   E. > 15 hours

12. Indicate if you are a member of a general teachers' association or union? (indicate one)
   A. Yes
   B. No

13. Indicate if you are a member of a subject matter teaching association?
   A. Yes
   B. No

14. Indicate how often you read a periodical(s) or journal(s) about teaching?
   A. Regularly
   B. Occasionally
   C. Rarely

15. Indicate how often you read a periodical(s) or journal(s) on a subject related to your teaching field?
   A. Regularly
   B. Occasionally
   C. Rarely
16. During the last year, indicate if you have attended any conferences in education in an area related to your teaching field?
A. Yes
B. No

In assessing your students' work, please indicate how often you use each of the following types of assessment. (Indicate one response for each type.)

<table>
<thead>
<tr>
<th></th>
<th>A. Frequently</th>
<th>B. Occasionally</th>
<th>C. Rarely or Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Standardized tests</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>18. Teacher-made essay tests</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>19. Teacher-made objective tests</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>20. Performance on homework</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>21. Performance on projects, term paper, etc.</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
</tbody>
</table>
Indicate the importance of each of the following in determining what you teach on a day-to-day basis. (Indicate one for each practice listed).

<table>
<thead>
<tr>
<th></th>
<th>A. Very Important</th>
<th>B. Of Some Importance</th>
<th>C. Of Little Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.</td>
<td>What I think the students in my class will need when they leave school</td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>23.</td>
<td>The official curriculum or syllabus</td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>24.</td>
<td>Prescribed textbook(s)</td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>25.</td>
<td>The external examinations that the student will have to take</td>
<td>A.</td>
<td>B.</td>
</tr>
<tr>
<td>26.</td>
<td>What the students will need at the next grade or in their next course</td>
<td>A.</td>
<td>B.</td>
</tr>
</tbody>
</table>
Indicate how often you use each of the following in your instruction. (Indicate one answer for each kind)

<table>
<thead>
<tr>
<th></th>
<th>A. Often</th>
<th>B. Sometimes</th>
<th>C. Rarely or Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Textbooks</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>28. Printed drill material</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>29. Individualized material (e.g. Programmed instruction)</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>30. Small group work</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>31. Individual tutoring or individual conferences for students</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>32. Audio-visual materials - TV, films, slides, radio, etc.</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>33. Field trips and special projects</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>34. Lectures</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>35. Questioning</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
<tr>
<td>36. Discussion</td>
<td>A.</td>
<td>B.</td>
<td>C.</td>
</tr>
</tbody>
</table>

37. Within a classroom, teachers sometimes organise students into small instructional groups according to whether they are fast, medium or slow learners. To what extent do you practice such within class grouping? (Indicate one)

A. Always or almost always
B. Frequently
C. Occasionally
D. Rarely or never
38. In which one of the following types of institutions did you receive the greatest amount of post-secondary school education (including teacher training)?

National Center - Unscaled Variables - See Notes.

DD1. This question has to be answered as question 1 in Section DD at the bottom of the reverse side of Card 11.

Are you employed at this school
Do you teach

A. Full-time
B. 3/4 - full-time
C. 1/2 - 3/4
D. 1/4 - 1/2
E. Less than 1/4 time.
Below are given 10 statements on the teaching of science. We are interested in obtaining information on how teachers regard the job of science teaching, will you therefore indicate against each item the extent to which you agree or disagree with each statement. Please answer by blackening in the appropriate space on your answer card.

1. Open-ended investigations are possible, and desirable, from the very beginning of science education.
   A. Disagree strongly.
   B. Disagree.
   C. No opinion.
   D. Agree.
   E. Agree strongly.

2. Practical experience is not essential for the acquisition of scientific knowledge.
   A. Disagree strongly.
   B. Disagree.
   C. No opinion.
   D. Agree.
   E. Agree strongly.

3. There is so much to learn about science nowadays that it is better not to take up time with practical work.
   A. Disagree strongly.
   B. Disagree.
   C. No opinion.
   D. Agree.
   E. Agree strongly.

4. A pupil may forget all he learned at school about the facts and principles of science but the experience he gains in carrying out his own practical investigations will last him in a good stead forever.
   A. Disagree strongly.
   B. Disagree.
   C. No opinion.
   D. Agree.
   E. Agree strongly.
5. A teacher's time is better employed in giving lectures and demonstrations than in preparing for laboratory work.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.

6. The difficulties of providing opportunities for practical work of an investigational nature are so great that teachers should be advised not to undertake such work.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.

7. A pupil's science education is not complete unless he has had opportunities for carrying out investigations on his own.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.

8. However hard-pressed a science teacher is, the top priority in his work should be to provide opportunities for his pupils to carry out their own original investigations.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.

9. At least half a pupil's time in science should be spent on practical work preferably in a laboratory or in the field.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.
10. Pupils gain little of value from carrying out their own investigations.

A. Disagree strongly.
B. Disagree.
C. No opinion.
D. Agree.
E. Agree strongly.
STUDENT QUESTIONNAIRES
Notes for interpretation and translation of IEA/2H, IEA/6H, and IEA/13

Item 1 The intent of this question is to discover whether the child prefers that part of the day which he spends in school to the time he spends elsewhere.

Item 2 "do well" connotes "get good grades, score high marks, pass examinations, etc."

Item 3 "work" here means academic work.

Item 4 This question deals with the problem of concentration and paying attention. It may be that National Centers will wish to reword this item extensively.

Item 7 This item deals with the perception of self as a discipline problem.

Item 8 National Centers may wish to reword this question. The idea to be included is that of obtaining as much educational experience as possible.

Item 9 See note for item 2.

Item 11 The wording has been somewhat changed from the form in IEA/ATT/GEN/1. If the word "challenging" is difficult to translate, then "exciting" and "stimulating" are possible alternatives.

Item 12 See note for question 4, although this item is concerned with work in general.

Item 14 "hard" means "diligently".

Item 15 Substitute other breaks in the school routine if applicable.

Item 16 Population I: "invented" need not be taken literally. The translation should connote "originated" and "developed". Populations II and IV: this question may need rewording of homework is not a common practice.

Item 17 Population I: National Centers may substitute another activity implying "initiating" of "competitive" behaviour if more applicable.
Item 18  Populations II and IV: if this item is inapplicable, substitute some other behaviour implying a low priority being given to school work.

Item 19  Population I: "games" here means "sports" and other competitive, non-intellectual pursuits. Populations II and IV: "leave school" implies "end school career", not "go home at end of day".

Item 21  Substitute other forms of higher education if "College or University" seems unrealistic for the children concerned.

Item 22  "lower marks" could mean "poorer grades" or criticism from the teacher after a test.

Item 23  Another phrase implying high valuation of school can be substituted if desired.

Item 24  An alternative statement implying a preference for not attending school would be acceptable.

Item 25  This item attempts to investigate the pressure for conformity of ideas.

Item 26  Some National Centers do not like this item in its present form, but they are asked to include it if possible. It attempts to measure the extent to which the informal periods spent by the children in school are governed by rules and regulations. National Centers may, of course, substitute an alternative which will measure the existence of these rules.

Item 27  "small" may be translated as "unimportant" and "insignificant." This item probes the emotional authority structure of the school.

Item 28  This item has been extensively reworded since its use in IEA/ATT/GEN/1. Its intention is to examine the existence of formal rules and discipline before the beginning of the academic school day. National Centers may substitute other equivalent behaviours.

Item 30  "good grades" may be translated as "high marks", "examination passes", or the like.

Item 31  "criticize" should be taken in its negative (that is, destructive) sense.
Item 32  In countries where this question seems inappropriate, another may be substituted. The intention is to discover whether any formal mark of respect is paid to the teacher at the beginning of a class session.

Item 33  In countries where no students have this choice, it is suggested that an alternative statement be included, such as the following: "The students can choose special projects to work on in some of our classes".

Item 34  If homework is not applicable, use some other phrase denoting work done by the students while not under the close supervision of their teacher.

Item 35  New item. See note for item 34.

Item 36  New item. National Centers may find it possible to state this item more simply. The distinction required is that between students who will not work and students who can not work. It is suggested that this distinction will be made in the more authoritarian schools and will not be made in permissive schools.
These questions are being put to a large number of students in different countries to find out what they think about themselves and the schools they attend. This is NOT a test. There are no right or wrong answers. We just want to know what you think. Your teacher will not see your answers.

To answer, circle the letter corresponding to the answer you choose for each question. If you wish to change an answer, you may, but be sure to erase the mark for the old answer completely.
Some of the items below are statements. Decide whether each one is generally true for you. If you agree with it, choose A; if you disagree, choose B.

Other items are questions. Choose A or B according to whether your answer is YES or NO.

1. The most enjoyable part of my life is the time I spend in school.
   A. Agree.
   B. Disagree.

2. Is it important to you to do well at school?
   A. Yes.
   B. No.

3. I generally dislike my school work.
   A. Agree.
   B. Disagree.

4. Does your mind often wander off subject during lessons?
   A. Yes.
   B. No.

5. Do you think school is rather a waste of time?
   A. Yes.
   B. No.

6. There are many school subjects I don't like.
   A. Agree.
   B. Disagree.

7. Do your teachers think that you misbehave too much?
   A. Yes.
   B. No.
8. I want as much education as I can get.
   A. Agree.
   B. Disagree.

9. Do you worry about not doing well in class?
   A. Yes.
   B. No.

10. I enjoy everything about school.
    A. Agree.
    B. Disagree.

11. I find school challenging.
    A. Agree.
    B. Disagree.

12. Do you find it difficult to keep your mind on your work?
    A. Yes.
    B. No.

13. School is not very enjoyable.
    A. Agree.
    B. Disagree.

14. Do you work hard most of the time?
    A. Yes.
    B. No.

15. The only things I can look forward to in school are weekends and holidays.
    A. Agree.
    B. Disagree.

16. Have you ever invented a new game?
    A. Yes.
    B. No.
17. Have you ever entered a competition?
   A. Yes.
   B. No.

18. Have you ever made something as a present for somebody?
   A. Yes.
   B. No.

19. Are you more interested in games than school work?
   A. Yes.
   B. No.

20. The only thing I like about going to school is the opportunity to meet my friends.
   A. Agree.
   B. Disagree.

21. I hope eventually to study at a College or University.
   A. Agree.
   B. Disagree.

22. If you were given lower marks than usual in a test, would this make you unhappy?
   A. Yes.
   B. No.

23. I agree with people who say, "school days are the happiest days".
   A. Agree.
   B. Disagree.

24. I would rather do more homework and spend less time at school.
   A. Agree.
   B. Disagree.
The remaining items in this section are statements about what happens in your school. If the statement is generally true for your school, choose A; if not, choose B.

25. Students rarely express opinions which differ from the teacher's.
   A. Agree.
   B. Disagree.

26. We are not allowed to sit in our classrooms during break.
   A. Agree.
   B. Disagree.

27. The teachers often make you feel small.
   A. Agree.
   B. Disagree.

28. Students can enter the school buildings as they arrive, without waiting to be lined up by the teachers.
   A. Agree.
   B. Disagree.

29. The students decide for themselves where they will sit in the classroom.
   A. Agree.
   B. Disagree.

30. In our school good behaviour is more important than good grades.
   A. Agree.
   B. Disagree.

31. The teachers always seem to criticize our best ideas.
   A. Agree.
   B. Disagree.
32. Most teachers expect us to stand up when they come into the classroom.
   
   A. Agree.
   B. Disagree.

33. We are allowed a free choice of some of the subjects we study.

   A. Agree.
   B. Disagree.

34. Most of our teachers are very strict about homework.

   A. Agree.
   B. Disagree.

35. The teachers do not usually punish a student who admits at the beginning of a lesson that he has not done his homework.

   A. Agree.
   B. Disagree.

36. There is a clear distinction made in our school between students who are lazy, and those who are less talented.

   A. Agree.
   B. Disagree.
These questions are being given to a number of children in several countries to find out what they think about Science and the part it plays in their lives. For most of the questions there are no right or wrong answers, so this is NOT a test. We just want to know what you think.

The answers to these questions should be put in Section K on your answer card. Blacken in the oval which contains the letter of the answer you choose for each question. If you wish to change an answer you may, but be sure to erase the mark for the old answer completely.
Accompanying Notes (IEA/1K, IEA/5K, and IEA/12K)

Notes for interpretation and translation

Population I, II and IV

Item 1 "marks" may be translated as "grades" or some other indication of the quality of work.

Item 3 If the study of Science is not optional, a National Center may wish to substitute a statement "I look forward to studying Science after....."

Item 5 "exhibition", "exposition" or "library" may be substituted for "museum" if more appropriate.

Item 6 "club" here means any gathering, formal or informal, at which attendance is voluntary.

Item 8 It is understood that this is an uncommon activity, and it should not be replaced merely for this reason. If it seems clear that only 2% or fewer of 10-year-old students are likely to be able to respond positively to this item, then an alternative should be substituted, although it is requested that the substitute be also a fairly complex scientific activity.

Item 11 National Centers may substitute any type of Science book or magazine other than school text book.

Item 12 If telescopes are rare or unknown, then any deliberate astronomical activity is acceptable.
For each of these four questions, select the best answer, and indicate it by marking the appropriate letter.

1. The marks I get in Science are usually .......
   A. better than in most other subjects.
   B. about average compared with other subjects.
   C. worse than in most other subjects.

2. I like Science ........
   A. more than most other subjects.
   B. about the same as other subjects.
   C. less than most other subjects.

3. I would like to study Science after the end of this school year.
   A. Yes.
   B. Not sure.
   C. No.

4. I hope that in my career I will be able to make use of some of the Science I learned at school.
   A. Yes.
   B. Not sure.
   C. No.

Below is a list of things you might do outside school. Look at each one and if it is something you do very often or used to do very often, mark A. If you have ever done it at all, mark B. If you have never done it, mark C.

5. Visit a Science museum.
   A. Often.
   B. Sometimes.
   C. Never.
6. Go to meetings of a scientific club.
   A. Often.
   B. Sometimes.
   C. Never.

7. Build working models of ships, cars or aeroplanes.
   A. Often.
   B. Sometimes.
   C. Never.

8. Build a radio set or other piece of electronic apparatus.
   A. Often.
   B. Sometimes.
   C. Never.

9. Visit an airfield to watch the planes.
   A. Often.
   B. Sometimes.
   C. Never.

10. Visit a harbour to watch the ships.
    A. Often.
    B. Sometimes.
    C. Never.

    A. Often.
    B. Sometimes.
    C. Never.

12. Look at the moon or the planets through a telescope.
    A. Often.
    B. Sometimes.
    C. Never.
13. Do Chemistry experiments with your own equipment.
   A. Often.
   B. Sometimes.
   C. Never.

Below is a list of some things you may do. If you do, mark A. If you do not, but would like to, mark B. If you are not interested to do it, mark C.

14. Make a hobby of studying or collecting flowers or leaves.
   A. I do it.
   B. I would like to.
   C. I am not interested.

15. Make a hobby of studying or collecting insects.
   A. I do it.
   B. I would like to.
   C. I am not interested.

16. Make a hobby of studying or collecting rocks or fossils.
   A. I do it.
   B. I would like to.
   C. I am not interested.

For the following questions indicate whether each of the statements is usually true for you in your school.

17. We have regular Science lessons.
   A. Yes.
   B. No.

18. We have a textbook for Science.
   A. Yes.
   B. No.
19. Our Science lessons include laboratory experiments in which we all take part.
   A. Yes.
   B. No.

20. We make observations and do experiments during our Science lessons.
   A. Yes.
   B. No.

21. The teacher gives us questions to answer while we do our experiments.
   A. Yes.
   B. No.

22. We usually make up our own problems and design our own experiments.
   A. Yes.
   B. No.
This test contains questions dealing with different branches of Science. Some you will know about from your school work, some from your general knowledge and others you will be able to answer by using common sense. Others you may not be able to do. Do not waste time over questions you cannot do; leave them and go on to the next question. You can come back to questions you have missed later, if you have time. You may answer even if you are not quite sure, but do not guess blindly.

Each of the questions or unfinished statements in this test is followed by five suggested answers, lettered A, B, C, D, or E. You have to decide which one answer you think best and then on your answer card make a solid pencil mark in the oval containing the correct answer letter.

Here is an example of how to fill in the answer on your answer card. Remember that the examples given on this page are to be answered in the section marked L on your answer card.

1. How long does the earth take to travel once around the sun?
   A. A day.
   B. A week.
   C. A month.
   D. A year.
   E. None of the above.

Since the earth travels round the sun in a year, the answer space D should be marked. This has been done on the answer card for question 1 in the example section L.

Now try these three questions for practice. Fill in the space of your chosen answer on the answer card in section L.

2. Water would be turned into ice by
   A. heating it.
   B. stirring it quickly.
   C. putting salt in it.
   D. pouring it into a shallow dish.
   E. cooling it.

3. Which day of the year in the southern hemisphere has the longest period of daylight?
   A. 21st January.
   B. 21st March.
Sometimes you may be asked to pick out the one wrong answer or the one that does not fit in with the others.

4. Which of the following does NOT belong to the same group as the others?

A. Eagle.
B. Lion.
C. Mouse.
D. Elephant.
E. Deer.

SECTION A

1. The sun is the only body in our solar system that gives off large amounts of light and heat. We see the moon because it is

A. reflecting light from the sun.
B. without an atmosphere.
C. a star.
D. the biggest object in the solar system.
E. nearer the earth than the sun.

2. Imagine yourself leaving a rocket ship on the surface of the moon. You would

A. be overcome with molten lava.
B. weigh less.
C. be poisoned by the atmosphere.
D. shoot off into space.
E. burn to death with the heat of the sun.
Questions 3 - 6 refer to the following chart which shows some readings made at different times on three days.

<table>
<thead>
<tr>
<th></th>
<th>6.0 a.m.</th>
<th>9.0 a.m.</th>
<th>12.0 Noon</th>
<th>3.0 p.m.</th>
<th>6.0 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>15°C</td>
<td>17°C</td>
<td>20°C</td>
<td>21°C</td>
<td>19°C</td>
</tr>
<tr>
<td>Tuesday</td>
<td>15°C</td>
<td>15°C</td>
<td>15°C</td>
<td>10°C</td>
<td>9°C</td>
</tr>
<tr>
<td>Wednesday</td>
<td>8°C</td>
<td>10°C</td>
<td>14°C</td>
<td>14°C</td>
<td>13°C</td>
</tr>
</tbody>
</table>

3. To obtain these readings it was necessary to have a
   A. ruler and a thermometer.
   B. barometer and a clock.
   C. ruler and a clock.
   D. thermometer and a barometer.
   E. thermometer and a clock.

4. When was the highest temperature recorded?
   A. Noon on Monday.
   B. 3.0 p.m. on Monday.
   C. Noon on Tuesday.
   D. Noon on Wednesday.
   E. 6.0 p.m. on Wednesday.
5. Which of the following instruments gives the temperature at 6.0 a.m. on Wednesday?

A. 
B. 
C. 
D. 
E. 

6. On one day a cool wind began to blow. When do you think this happened?

A. Monday morning.  
B. Monday afternoon.  
C. Tuesday morning.  
D. Tuesday afternoon.  
E. Wednesday afternoon.
7. Which of the following statements is true about seeds?

A. All plants produce seeds.
B. All fruits contain a large number of seeds.
C. All seeds are good to eat.
D. Every seed contains a young plant, stored food and a seed coat.
E. The food stored in seeds is always in the cotyledon.

8. Tom wanted to learn which of three types of soil - clay, sand or loam - would be best for growing beans. He found three flowerpots, put a different type of soil in each pot, and planted the same number of beans in each, as shown in the drawing. He placed them side by side on the window sill and gave each pot the same amount of water.

Why was Tom's experiment NOT a good one for his purpose?

A. The plants in one pot got more sunlight than the plants in the other pots.
B. The amount of soil in each pot was not the same.
C. One pot should have been placed in the dark.
D. Tom should have used different amounts of water.
E. It would get too hot on the window sill.
9. John put some seeds on moist cotton wool in a dish. Jane put some seeds of the same kind into a glass full of water by the side of his. After two days John's seeds sprouted but nothing seemed to happen to Jane's. Which of the following is the most probable explanation?

A. Jane's seeds had been kept dry for too long.
B. Jane did not allow her seeds enough air.
C. Jane did not put the glass in a warm enough place.
D. Jane should have used a different kind of seed.
E. Jane did not use any cotton wool.

10. John's pet rabbit was injured by a car and became lame. Some months after the accident she produced a litter. Which of the following describes what the babies would probably be like?

A. All of them would be lame because the mother was.
B. Most of them would be lame but not all of them because the father was not lame.
C. Most of them would not be lame because the father was not lame.
D. None of them would be lame because the mother's lameness was due to an accident.
E. Only one of them would be lame because the mother was lame.

11. A certain wild bird has webbed feet. In which of the following places would you be most likely to find it?

A. A forest.
B. A meadow.
C. A cornfield.
D. A desert.
E. A lake.

12. Paint applied to an iron surface prevents the iron from rusting by

A. Preventing nitrogen from coming in contact with the iron.
B. Reacting chemically with the iron.
C. Preventing oxygen and moisture from coming in contact with the iron.
D. Preventing carbon dioxide from coming in contact with the iron.
E. Making the surface of the iron smoother.
13. Which one of the following is often used for making the metal containers in which food is preserved and sold?

A. Tin with a thin coating of steel.
B. Steel.
C. Nickel.
D. Copper.
E. Steel with a thin coating on it.

14. Mary and Jane each bought the same kind of rubber ball. Mary said, "My ball bounces better than yours." Jane replied, "I'd like to see you prove that." What should Mary do?

A. Drop both balls from the same height and notice which bounces higher.
B. Throw both balls against a wall and see how far each ball bounces off the wall.
C. Drop the two balls from different heights and notice which bounces higher.
D. Throw the balls down against the floor and see how high they bounce.
E. Feel the balls by hand to find which is the harder.

15. In order to open a can of tomato juice Betty punched two holes. Why do you think she did this? To

A. let the juice pour out of the can more slowly.
B. let the air go into one hole while the juice poured out of the other.
C. let the air get into the can before the juice was poured.
D. let the juice pour out of the can more quietly.
E. watch how the juice was pouring out.
16. Betty wanted to seesaw with her little brother, George. Which picture shows the best way for Betty, who weighed 100 pounds, to balance George, who weighed 50 pounds?

A. Picture K  
B. Picture L  
C. Picture M  
D. Picture N  
E. None of these

17. Tony was using his hand pump to put more air in the tire. After a while he found that it became harder to use the pump. This was because the

A. air in the tire pushed against the pump.  
B. air started to leak out of the pump.  
C. pump got too hot to hold.  
D. pump got too sticky to push.  
E. tire is bigger than the pump.

18. When water is boiling it

A. changes colour.  
B. becomes heavier.  
C. changes to steam.  
D. gets hotter.  
E. stops bubbling.
19. The picture shows Masao and his friends playing with a thread-telephone. Hanako is speaking. Masao and Akira are trying to listen. Which of them can hear her speak?

A. Both of them can hear equally clearly.
B. Neither of them can hear.
C. Akira alone can hear clearly.
D. Masao alone can hear clearly.
E. Both of them hear equally faintly.

20. Harry wondered if sound is able to travel through water. To find out by an experiment which of the following should he do?

A. Hit two stones together in a jet of water.
B. Hit two stones together above the water of a lake or swimming pool and listen to the sound.
C. Put his ear next to the water of a lake or swimming pool and hit two stones together above the water.
D. Put his head under the water of a lake or swimming pool and hit two stones together in the water.
E. Drop a stone into the water and listen for the splash.

END OF SECTION A
1. Let us imagine you are taking a trip to the moon in a rocket ship. As the rocket ship approaches close to the moon, you would be travelling through

A. air.
B. clouds.
C. gas.
D. space without air.
E. time.

2. About how long would it take a rocket ship to reach the moon?

A. Two hours.
B. Several hours.
C. A few days.
D. A light-year.
E. Several years.

3. At different times during a sunny day a tree was seen to have cast a shadow of different length as shown in the diagrams below. Which diagram shows the shadow at midday (12.00 hours)?
4. The reason that milk kept in a refrigerator does not go sour is that the cold

A. changes the water of the milk into ice.
B. separates the cream.
C. slows down the action of bacteria.
D. keeps flies away.
E. causes a skin to form on the surface.

5. Which one of the following plants is NOT grown for food?

A. Wheat.
B. Rice.
C. Potato.
D. Sugar cane.
E. Cotton.

6. John brought the skull of a dead animal to school. His teacher said she did not know what the animal was but she was sure that it was one that preyed on other animals for its food. Which clue, do you think, led her to this conclusion?

A. The eye sockets faced sideways.
B. The skull was much longer than it was wide.
C. There was a projecting ridge along the top of the skull.
D. Four of the teeth were long and pointed.
E. The jaws could work sideways as well as up and down.

7. While Joe was sitting under a tree, he watched a bird getting insects from between the cracks of the bark. Which drawing shows the kind of beak this bird had?

A.  
B.  
C.  
D.  
E.  
8. If, immediately before and after a 50 meter race, your pulse and breathing rates were taken, you would expect to find

A. no change in pulse but decrease in breathing rate.
B. an increase in pulse but no change in breathing rate.
C. an increase in pulse and breathing rate.
D. a decrease in pulse and breathing rate.
E. no change in either.

9. Flowers cannot usually produce seeds unless

A. they are visited by insects.
B. they appear in the summer.
C. they are on plants growing in good soil.
D. they produce nectar.
E. suitable pollen is placed on their stigmas.

10. Some seeds germinate best in the dark, others in the light, while others germinate equally well in the dark or the light. If you wanted to find out by means of an experiment to which group a certain kind of seed belonged, you would sow some of the seeds on damp blotting paper and

A. keep them in a warm place in the dark.
B. keep one batch in the light and another in the dark.
C. keep them in a warm place in the light.
D. sow some on dry blotting paper and keep them in the light.
E. sow some on dry blotting paper and keep them in the dark.

11. Which one of the following animals does not usually live in the kind of place shown?

A. Zebras on grassy plains.
B. Seals on rocky sea shores.
C. Beavers on river banks.
D. Monkeys in forests.
E. Moles in rocky places.
12. John gave some reasons why kettles and kitchen pans are often made of copper. Which of his reasons was wrong?

A. Copper is a bad conductor of heat.
B. Copper is a tough metal.
C. Copper can be polished to give a pleasing finish.
D. Copper is easy to shape.
E. Copper does not dissolve in hot water.

13. What gas in the air is essential for us to breathe in order to live?

A. Nitrogen.
B. Oxygen.
C. Carbon dioxide.
D. Hydrogen.
E. Water vapour.

14. When Tom threw his rubber ball into the air, it came back to the ground because

A. the air pushed it back.
B. rubber always bounces back.
C. the earth pulled it back.
D. the air is very light.
E. the earth is a large magnet.

15. Ann was playing with a bubble pipe. When the bubble was the size of the one in the picture, she took the pipe out of her mouth. What do you think happened to the bubble after that?

A. It got larger for a time and then stayed at this size.
B. It got smaller for a time and then stayed at this size.
C. It got smaller and smaller and disappeared into the pipe.
D. It stayed on the pipe without getting larger or smaller.
E. It became larger and larger until it burst.
16. Some children had made a space-ship from wooden boxes. Today they are making plans for their first trip to the moon. Judy says, "Scientists tell us that the moon has no atmosphere." Jack asks, "How can we keep in touch with each other?" Which one of the children's ideas is best?

A. Judy says, "Let's take a garden hose to use as a speaking tube."
B. Phil says, "Let's find out from Mr. Jones where he got his hearing aid. We could take some of those."
C. Joe says, "Let's make sure we take enough walkie-talkies with plenty of fresh batteries."
D. Betty says, "Let's bring along some large megaphones like the cheerleaders use."
E. John says, "Our voices would carry better on the moon and there would be no problem."

17. Betty was trying to take the metal screw-top off a jar of jam but it wouldn't turn. What should Betty do in order to open the jar with the least risk of breaking it?

A. Force the cap off with a screw driver.
B. Run hot water on the glass part of the jar.
C. Run cold water on the cap.
D. Hammer the cap off.
E. Run hot water on the cap.

18. As part of an investigation a cupful of water and a similar cupful of petrol were placed on a window sill on a hot sunny day. A few hours later it was observed that both the cups had less liquid in them and that there was less petrol left than water. The experiment showed that

A. all liquids evaporate.
B. petrol gets hotter than water.
C. some liquids evaporate faster than others.
D. liquids will only evaporate in sunshine.
E. water gets hotter than petrol.
19. Some boys made a set of chimes by cutting four pieces of pipe of different lengths from a long metal pipe and hanging them as shown in the picture below. Which of the pipes gave the lowest note when they struck it with a hammer?

A. Pipe (X)
B. Pipe (Y)
C. All gave the same note.
D. You cannot tell without trying.
E. It depends on where you hit it.
20. A flashlight holds two cells. In order to make it work, in which of the following ways must we place the cells?

A. As in K
B. As in L
C. As in M
D. Either as in L or M
E. None of these would do.

END OF SECTION B
Directions

This is a test to see how well you understand what you read. The test is made up of four stories with a number of questions on each. Read the first story and then answer the questions on each. Then go on to the second story and so on until you come to the end of Section C.

Each question has four possible answers. Pick the best ending or answer and blacken the oval on the answer card which has the same letter as the answer you have chosen.

You may read the story over again as much as you need to. Try each question in turn. If you don't know the answer, leave it and go on to the next question. You may come back to it later if you have time.

Please answer even if you aren't quite sure. However, do not guess blindly.

When you finish one story go on to the next. Continue until you reach the end of Section C. If there is time left, go back and try to do any that you omitted.
One of the most interesting birds I have seen is the Indian Tailor Bird. It is a small olive green bird that doesn't look at all unusual, yet it has a most unusual way of making its nest. The birds work together in pairs. First they find a leaf, the right size, and make holes along the edges with their beaks. Through these holes they thread grass. One bird pushes the thread from the outside, while the other bird sits in the nest and pushes it back until the edges of the leaf are sewn together to make a kind of bag, still hanging on the tree, in which the Tailor Bird lays its eggs.

1. What does the Tailor Bird use in place of thread?
   A. Grass.
   B. String.
   C. Spider web.
   D. Thorns.

2. The Tailor Birds are interesting because they
   A. are small and olive green in colour.
   B. live in pairs.
   C. make their nests in a special way.
   D. fly very fast.

3. The Tailor Bird got that name because it
   A. is a small bird.
   B. looks unusual.
   C. can sew.
   D. has a beak shaped like a needle.

4. The Tailor Birds make their nests
   A. from leaves.
   B. in a hole in a tree.
   C. in the tall grass.
   D. with a lining of grass.

5. The person who wrote about Tailor Birds was trying to
   A. give you some new information.
   B. tell you a story.
   C. get you to share his feelings.
   D. keep you guessing on how the story will come out.
Once I watched a mother seal with twin babies for an hour or two and could have spent hours more observing them if time had permitted. Sometimes the two little animated balls of down would snuggle side by side and suckle together while their mother dozed. Then the little imps would play pranks on her, brushing and tickling her face with their flippers and nipping at her head and neck as they frisked and teased around her. She dozed with one eye held open, always keeping a watchful glance upon her offspring and now and again she would lift her head to regard them and to give a deep bay, which I could only interpret as an expression of unalloyed contentment with her happy lot.

Like a cow licking her calf, occasionally she would caress her babies, snuffling and nibbling, for seals are short-tongued creatures.

6. The mother kept watch over her babies while she rested by
   A. lifting her head to watch them.
   B. dozing with one eye open.
   C. caressing them fondly.
   D. suckling them.

7. The writer calls the baby seals "imps" because they
   A. did not like to stay still.
   B. liked to tease their mother.
   C. snuggled side by side.
   D. were small.

8. The writer lets us know it is hard for the mother to lick the baby seals because
   A. they will not keep still.
   B. she has a short tongue.
   C. she goes to sleep.
   D. they tickle her face.

9. The writer thought that watching the seals was very
   A. exciting.
   B. useful.
   C. difficult.
   D. interesting.

10. the writer talks about the baby seals and their mother as if
    A. he had never actually seen them.
    B. they were lifeless.
    C. they were human.
    D. they were troublemakers.
Robert, standing in the stern, was confidently poling the punt over the waters of the narrow river that sunny afternoon, while Joan sat on the cushions facing him, trailing her hands in the cool water. Robert was proud of his skill, and was poling along with quite a flourish. The punt approached the lowest bridge on the river, where Robert knew he must bend low to avoid the arch. Alas! Though he bowed low, the pole stood upright, wedging itself in the mud of the river bed and against the arch of the bridge.

There was a brief struggle while Robert tried to decide whether to leave the pole and stay on the punt or accept the alternative. But the punt wouldn't wait for decisions and Robert was left clinging to the pole. Further and further into the mud the pole sank, while he climbed higher and higher to keep out of the water. Just when it seemed to the amused watchers that he must at last fall in, he was saved. Joan managed to paddle the punt back to his rescue.

11. When the pole started to sink into the mud, Robert
   A. began to get wet.
   B. called to Joan for help.
   C. climbed up the pole.
   D. climbed onto the bridge.

12. The punt had two things to make it go. These were a
   A. pole and a paddle.
   B. pole and a pair of oars.
   C. pole and a motor.
   D. paddle and a pair of oars.

13. When Robert has to "accept the alternative", the
    alternative was to
   A. jump into the river.
   B. stay in the boat.
   C. have Joan save him.
   D. hang onto the pole.

14. How did Joan feel about Robert's mishap?
   A. we cannot tell.
   B. she was amused.
   C. she was embarrassed.
   D. she was angry.

15. The pole was held upright at the bridge by
   A. only the mud on the river bottom.
   B. only the arch of the bridge.
   C. both the mud and the bridge.
   D. Robert holding onto it.

16. We know that the river was not very deep because
   A. Robert pushed the punt with a pole.
   B. punts do not need much water.
   C. the bridge was very low.
   D. the bottom was muddy.
For three or four thousand years a family of marmots had been settled in a grassy little valley under the cliffs of a jagged peak whose present name is the Rock of Wonders. The maps specify that the peak is about seven thousand two hundred feet in altitude.

The spot was a remarkably suitable one for all sorts of good reasons. In the first place, the slope faced south. The sun shone on it from dawn until dark, and in the spring the snow melted there faster than anywhere else. One could warm oneself as much as one wished, or again one could sit in the shade of huge rocks fallen from the heights of the mountain. A little way off a tiny spring fed a little lake. Thanks to this fresh spring, which never dried up, the grasses round about grew thick and strong, even in the month of August.

The rocks provided many sitting places and perfectly safe holes where one could take refuge in an emergency. As for the Family Cave, hollowed out many years ago by the grandfather of the present inhabitant, it opened out pleasantly from under a flat slab between two clumps of arnica. Since it had already been improved by two generations, it would have been difficult to find a drier and more comfortable apartment.

17. Why had the marmots lived so long in one place?
A. They did not like to travel.
B. They could not climb down the cliffs.
C. They came there long ago.
D. It was a very good place.

18. What kept the grasses in the valley green and healthy all summer?
A. The warm sun.
B. The melting snow.
C. The high peak.
D. A spring.

19. Why was it a good thing that the valley faced to the south?
A. The summer days were warmer.
B. Winter snows melted early.
C. The best view was to the south.
D. Marmots need a lot of sun.
20. From the story we know that marmots like to live in a home that is
   A. warm.
   B. light.
   C. dry.
   D. large.

21. The last sentence of the story makes us think that the marmots will
   A. make many new homes.
   B. continue to live in the Family Cave.
   C. have many babies.
   D. work hard to make the cave comfortable.

END OF SECTION C
The sundew is a small, pretty plant, that grows in damp, boggy places. Its leaves grow in clusters on slender reddish stems. On each leaf there are several beautiful shining drops that look like the smallest dewdrops you can imagine. A passing insect sees the drops and thinks they are drops of sweet nectar. He lights on the sundew's leaves. Surprise! The sticky drop is not nectar. It is the glue that the sundew uses to attract insects. The small leaves close over the insect. Soon the insect disappears, for the sundew is one of the strange plants that eat living insects.

1. Insects are most attracted to the sundew when they want to
   A. play.
   B. hide.
   C. rest.
   D. eat.

2. An insect lighting on a sundew disappears in the
   A. sunlight.
   B. sky.
   C. plant.
   D. bog.

3. When an insect that has lighted on a sundew disappears, it has
   A. been eaten.
   B. flown away.
   C. gone to sleep.
   D. fallen to the ground.

4. You would expect to find the sundew growing in places where it was
   A. cold.
   B. wet.
   C. high.
   D. grassy.

5. The sundew's leaves are
   A. slender.
   B. shining.
   C. in clusters.
   D. covered with dew.
Ernenek slipped out of his sleeping bag. On top of his clothes made of small auk's skins, with the feathers inside, he put on other clothes made of bear skin, with the fur on the outside and pushed the trouser legs into his sealskin boots.

He came out of the narrow tunnel of the igloo on all-fours, pulling the half-asleep dog, who was the leader of the team, by its leash, while the other dogs followed yawning and shaking the rime off their thick fur. They clamoured for food by barking and showing their teeth which had been filed with stones so that they could not gnaw their bridles; they looked more like wolves than dogs with their pointed muzzles and their yellow, glowing eyes.

Ernenek iced the sledge runners, then he harnessed the dogs, unfastened the sledge anchor and climbed on to the sledge. Under the whip, the dogs formed out behind the leading dog, pulling on the traces which attached them separately to the sledge and yelping behind the white clouds of vapour coming out of their mouths.

It was hot; the temperature must have been about 17 degrees below zero and Ernenek did not have to run behind the sledge to warm himself; he could remain sitting and enjoy the drive.

The icy ocean on which he travelled, frozen to a depth which exceeded a man's height and superficially covered with snow, bore the clear trace of the sledge of his friend who had started before him.

Ernenek did not turn to look at the solitary igloo he was leaving behind, a minute cute hump of ice at the top of the world.

6. Ernenek's dogs resembled wolves because they had
   A. a very sharp sense of smell.
   B. filed teeth and a small muzzle.
   C. great strength to pull the sledge.
   D. pointed muzzles and glowing eyes.

7. We can tell from the passage that auks are
   A. animals like bears.
   B. related to seals.
   C. dogs that pull sledges.
   D. birds.
8. The dogs' teeth had been filed with stones to make them
   A. sharp.
   B. clean.
   C. smooth.
   D. blunt.

9. Why did Ernenek ice the runners of his sledge?
   A. to cool them off.
   B. to make them slippery.
   C. so he could harness the dogs.
   D. to remove the dirt.

10. In describing the dogs, the writer tries to make them seem
   A. brave.
   B. strong.
   C. well-trained.
   D. savage.

11. In saying that Ernenek's igloo was "at the top of the world", the writer means that it was
   A. on the icy ocean.
   B. near the North Pole.
   C. far from any other home.
   D. very small and unimportant.

12. We can tell from the fourth paragraph that
   A. It was a really hot day.
   B. Ernenek hated to run.
   C. Ernenek got cold easily.
   D. Ernenek was used to very cold weather.
Simonides was a poet. He wandered round the wealthy cities of Asia, composing poems and singing the praises of warriors for such reward as he could gain. By this means he gathered a considerable amount of wealth, and after some years he made up his mind to return by sea to his native island of Ceos. While he was on the ship, a dreadful storm arose, and all the passengers began in panic to gather together their precious belongings.

Simonides stood on the deck calmly, making no effort to gather up his own baggage. Some of the other passengers were amazed at this, and one of them asked Simonides why he was not trying to save any of his property. "All my real wealth", said Simonides, "is in my head". The others laughed at the foolish poet, and as the ship foundered they leapt into the sea weighed down with all their possessions. Some of them attempted to carry such heavy burdens that they drowned. Others managed to struggle ashore. But here they were set upon by thieves, who stripped them naked of all that they owned.

Simonides, meanwhile, made his way to the nearest town, without being robbed, since he had nothing for the thieves to take. No sooner was he in the streets than he was recognized by a lover of his poetry, and showered with clothes, gifts and hospitality.

Next day, as he was walking with some of his new friends and admirers, Simonides happened to see some of his fellow travellers, who were begging for food and shelter. As soon as he saw them, Simonides said, "You see, you laughed at me on the ship when I said that my real wealth was in my head. But now you are beggars while I am well clothed and on my way to being prosperous again; now I can help you. What you have tried to save is all lost. But I carried my riches along with me - my poems".

13. Simonides had made his living by composing poems that told of

A. the beauty of nature.
B. life on the sea.
C. life in ancient times.
D. the great deeds of warriors.
14. The other passengers laughed at Simonides because he
   A. had no baggage.
   B. did not try to save his possessions.
   C. was so frightened of the storm.
   D. read poems during the storm.

15. The thieves did not rob Simonides because he
   A. was recognized by them.
   B. had no possessions.
   C. made poems for them.
   D. was able to escape them.

16. What suggests that Simonides' poems were not written down?
   A. He said his real wealth was in his head.
   B. He did not try to gather his belongings.
   C. They had to do with the deeds of warriors.
   D. No one recognized his poetry.

17. When Simonides said "my real wealth is in my head", he meant
   A. by his knowledge he could earn new wealth.
   B. beauty is more important than mere possessions.
   C. he had very little that he owned.
   D. he was a very intelligent man.

18. The idea that the writer of this story is trying to get over to us is that
   A. possessions are of no value.
   B. life is dangerous and uncertain.
   C. poetry may be wealth.
   D. poetry is beautiful.

19. In this story, the author's main purpose is to
   A. entertain his reader.
   B. write very beautifully.
   C. weave a lesson into the story.
   D. give some useful information.
Before the advent of hunters with guns, the musk ox was king of the tundra. His heavy coat protected him against the cold of winter and the swarms of bloodsucking insects in summer. With his heavy hooves he could break the ice crusts that covered the willow branches he was so fond of. When danger threatened, the bulls lined up before the cows and their young. With their strong, sharp horns they were more than a match for wolves or hunters with primitive weapons. But when they lowered their heads and charged they made an easy target for a huntsman with a gun. And so now there are only about seven thousand musk oxen.

20. The word "advent" in line 1 most nearly means
   A. sport.  
   B. attack. 
   C. ending. 
   D. arrival. 

21. If a hunter went to hunt the musk ox in summer, the worst trouble he would face would be
   A. wolves. 
   B. insects. 
   C. the charge of the bulls. 
   D. a chance of frost-bite. 

22. The last sentences suggest that
   A. the musk oxen are dying off. 
   B. the musk ox is a stupid animal. 
   C. the musk ox cannot survive in today's world. 
   D. hunters are killing too many musk oxen. 

23. The musk ox lives in the
   A. far North. 
   B. desert. 
   C. jungle. 
   D. mountains. 

24. The writer's feelings about the musk ox can best be described as
   A. fear of such a powerful animal. 
   B. eagerness to go and hunt one. 
   C. interest in their care for their young. 
   D. concern that they may all be killed. 

END OF SECTION D