

# FIELD PAPERS

## YEMEN ARAB REPUBLIC

Proposal for the  
Design of an EMIS for the  
Yemen Ministry of Education

July 1986

### IEES

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United States Agency for International Development  
Bureau for Science and Technology  
Office of Education  
Contract No. DPE-5283-C-00-4013-00

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Agency for International Development  
Bureau for Science and Technology  
Office of Education  
Contract No. DPE-5823-C-00-4013-00  
Project No. 936-5823

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## SUMMARY

### **A Proposal for the Design of an Educational Management Information System for the Yemen Ministry of Education**

July, 1986

A proposal developed for  
The Yemen Ministry of Education  
in collaboration with USAID/Yemen and  
The Improving the Efficiency of Education  
Systems (IEES) Project

This paper proposes the design of an education management information system (EMIS) for the MOE and suggests how it can be used to improve educational planning and efficiency. It is intended to serve as a working paper for senior Ministry officials who are planning the EMIS, staff members who will be assigned to the EMIS, and donor groups assisting the MOE in this area.

#### **Overview of a computer based educational management information system**

An educational management information system (EMIS) is an overall system for providing relevant and timely information to ministry officials. An EMIS consists of five components:

- (1) a specification of data needs and selection of appropriate indicators;
- (2) a procedure for collecting, coding, and storing the data;
- (3) a computer system (the computers and the computer programs, called "software") capable of analyzing the data;
- (4) personnel trained to operate the computer and the computer software; and
- (5) personnel who can interpret the information after it has been analyzed and relate the results back to the questions and policy issues under discussion.

If any one of these components is missing, the usefulness of the EMIS will be severely limited and the effort to develop it will be wasted.

#### **Recent Progress of the MOE in Collecting and Using Educational Information**

Over the last two years the MOE has made important progress in developing an educational data base:

1. The EHR Sector Assessment consolidated and interpreted information from across the Ministry of Education.

2. Efforts continue within the Ministry to consolidate responsibility for data collection and analysis in the Department of Planning and Statistics.

3. The MOE, with the assistance of USAID, will install three IBM compatible microcomputers.

4. During July, 1986, six staff members from the MOE and the ERDC currently attended a workshop on data coding and computer entry.

5. The ERDC currently is conducting a national school location and facilities (SLF) study which will provide additional data about school enrollments, staffing, facilities, and educational costs.

6. The ERDC has ordered an IBM compatible mini-computer which will be used in the analysis of the SLF data.

7. Substantial analysis of recent enrollment, staffing, and facilities data had been undertaken as part of the development of the Third Five Year Plan.

At present, the ability of the MOE to obtain and use current, accurate and reliable information in educational planning is limited by three things:

1. Personnel in the schools who are responsible for providing information often make reporting errors. At present, no system is employed to monitor the quality of the data reported by the schools.

2. Data analysis is done by hand. With over 6000 schools, the size of the data set sharply limits the types of analysis that can be meaningfully performed. Even when data is available, it often is not used because it cannot be analyzed quickly or in a manner that responds to the policy questions under discussion.

3. It is not yet clear what types of information (beyond basic enrollment and staffing data) will be most important to collect or how the information should be analyzed and presented to be of the greatest use to Ministry officials.

The MOE has identified four types of information are of particular importance to the MOE as a basis for planning.

1. The most pressing information need in the MOE is for current, reliable, and accurate information describing the status of the educational system.

2. Financial information on the cost of education at each level is necessary in order to more accurately track current costs and how they would be affected by proposed policy changes.

3. Current population information is necessary as the basis for more accurately predicting future demand for education, for planning the appropriate location of educational facilities, and for planning the allocation of future educational services.

4. A wider range of indicators of educational quality need to be identified or developed.

### Physical Setup and Operation of a Computer Center

The location of the computer equipment should reflect six considerations:

(a) Adequate space must be provided for the computers, printers, computer paper and supplies, and for the computer operators.

(b) The computers should be located near each other. Computer operators need to be able to assist each other in solving programming problems.

(c) Computers are sensitive to dust and heat. It is essential that the computers be kept in an air conditioned area and protected from dust and dirt.

(d) Computers also are sensitive to rough treatment and misuse. It is important to house the computers in an area that is secure and protected from persons not trained in their use.

(e) Enough space should be provided so that the output (paper on which the results of the analysis are written) can be organized and stored properly to ensure that it can be located quickly when it is needed by an MOE official.

(f) Operating a computer often requires concentration. The space should allow for privacy by limiting the access of people to the computer work area.

### Location of personnel

(a) The people trained to operate the EMIS should be located near one another to assist each other with questions or problems that arise in operation of equipment or formulation of an analysis.

(B) The MOE should consider locating the EMIS in the ERDC. The MOE central offices are already overcrowded and adequate space for a computer center may be difficult to locate in that office area. Adequate space is available and could be air conditioned and secured at less expense than space in the MOE. Further, the MOE and the ERDC computers staffs would be in close proximity and could assist each other in solving technical problems. The proximity could help ensure that computer personnel in the MOE and ERDC are aware of how each group is coding data, defining variables, and formulating data analysis. Also, the proximity of MOE and ERDC personnel will help encourage collaboration between groups.

### **The Training of Personnel**

Successful operation of an EMIS require at least four skills: (a) conceptualizing the data needs and developing the mechanisms to collect the desired data, (b) data coding and entry skills, (c) the operation of computer equipment and commercial software, and (d) the interpretation of data.

Training in the operation of microcomputers and selected computer programs can be conducted effectively through a series of short training courses. Whenever possible, these should be conducted in Yemen using the equipment in the MOE. This strategy makes it possible for more Ministry staff to participate in the training and reduces problems trainees sometimes have in transferring their training from one type of microcomputer to another.

In addition to training in operating a computer, selected MOE staff should be sent for long-term training in planning, statistics, and policy analysis. Following training, these staff members should move into positions within the MOE where they can help identify and formulate the data needs related to larger policy issues, select and develop the appropriate type of data analysis, and interpret the results in a manner that ties the data back to the policy issues under discussion.

While a continued program of staff training will be important to the continued development of trained EMIS staff, retention of those personnel with training and experience will also be important. Personnel with computer skills will have many job opportunities available to them and keeping them in the MOE will require an effective incentive system.

### **Selection of computer programs**

The EMIS should rely on commercially available programs. At this point in development of the MOE data system, all data

analysis needs of the MOE can be met through the use of commercial programs. Further, staff can learn to run commercial programs much more easily than machine language programs. It is not necessary for an EMIS staff member to know machine language programming to be able to compute the statistics the MOE needs for planning.

Particularly during the first few years of implementation, the EMIS should employ only a small number of commercial programs and all computer staff members should become proficient in those programs. The use of too many different programs leads to three problems:

- (1) Staff members are not able to help each other solve problems if they are not familiar with each other's programs.
- (2) Data sets may be developed and formatted for different programs making it difficult to combine data sets or run summary analyses.
- (3) If EMIS staff leave their Ministry job, the data analysis on which they were working cannot easily be picked up by other staff members.

Staff should be encouraged to experiment with other computer programs, but official work should be limited to those selected for Ministry use.

Two commercial programs appear to have particular advantages for the MOE.

ENABLE: this program consists of five subprograms:

- spreadsheet analysis - used to analyze columns and rows of numbers.
- data management - used to organize and move data files.
- graphics - used to develop charts and graphs.
- word processing - used to write reports and text in English.
- spelling checker - checks spelling of English text and identifies misspelled words.

The particular advantages of ENABLE are discussed in the longer paper.

SPSS-PC+: This program is specially designed for statistical analysis of data using a micro-computer. It offers a wide range of statistical techniques appropriate for analyzing large and somewhat complex data sets. SPSS-PC+ is easy to use and offers a wide range of statistical techniques. Its primary use with the Yemen MOE data is for computing trends in the data from schools, districts, and Governorate over several years.

In addition to ENABLE and SPSS-PC+, the MOE should explore the availability of commercial word processing programs in Arabic.

### Sources of Data for the EMIS

Three data sets form the core data for the EMIS: the annual school enrollment survey conducted by the MOE, the School Location and Facilities Study conducted by the ERDC, and the 1986 census, available from CPO.

### Collection of Data

Low data quality is the primary problem in current MOE data collection efforts. The MOE should emphasize improving the quality of the data it now collects rather than expanding its data collection activities.

To improve data quality, the MOE should

- (1) provide training to governorate and school level officials on correct procedures for completing questionnaires;
- (2) institute data verification procedures in which questionnaires are checked for obvious errors before being sent to Sanaa;
- (3) employ verification procedures in data entry, in which data entry from a random number of surveys is double checked; and
- (4) use a systematic data cleaning procedure to identify and adjust for missing data or out of range numbers.

In addition, the MOE may wish to explore the use of edge coding the Annual Enrollment Survey so that data can be keypunched directly from the questionnaire. Edge coding improves data quality by reducing the number of times data is transferred during the data entry stage. These procedures are discussed in the full paper.

The MOE, ERCD and CPO should employ a common village location coding scheme. This coding scheme provides a way to combine data about the same geographical location across different data sets.

### Analysis, Interpretation, and Reporting of Data

The type of analysis is determined by how the data will be used. The proposed EMIS will have three primary uses in the MOE.

1. To describe the education system.

The descriptive analysis draws on data from the annual enrollment survey conducted by the MOE.

2. To identify and monitor trends in enrollment, staffing, facilities use, and costs.

As comparable information about the educational system is collected each year, it will be possible to identify the direction and magnitude of changes in the educational system.

3. To develop projects of educational costs and financing and the supply and demand of educational services.

Data on recent trends can be combined to develop projections of future events within the education sector.

At early stages of development of the EMIS, priority should be given:

(1) to analysis of data already collected by the Ministry, ERDC, and CPO rather than collection of additional types of data;

(2) to further descriptive analysis of the data base provided by the Annual Enrollment Survey;  
Only as the data quality improves, as computer operators become experienced in using the computer, and as staff trained in statistics and planning are available should the EMIS move to more complex analyses.

(3) to identifying trends over time by combining comparable district, governorate, and national level data over time.

### **Interpretation of Data**

Interpretation of data should emphasize common sense and logical reasoning. Its role is to relate the results of data analysis back to the policy discussions in the ministry

### **Reporting Results**

Data should continue to be reported in forms in which the MOE staff is already familiar. Presentation of results in tables is widely understood and, for that reason, most useful. All tables and charts should have the source of data, type of analysis, data definitions, and assumptions of the analysis well documented.

### **Documentation**

The EMIS should maintain a library of all codebooks and final computer analysis for each data set.

#### **Distribution of Information from the EMIS**

The MOE should develop policy regarding the distribution of results of routine analysis. It is recommended that most routine analysis (e.g., school enrollments, staffing, and facilities use) be given wide distribution within the MOE so that MOE officials are all working from the same educational statistics.

#### **Organizational Issues**

The development of the EMIS can give the MOE more reliable, accurate, and timely data to use in education policy development. However, data can also limit choices. They can constrain decisions based on political or social considerations by forcing people to defend their decisions on more objective grounds. Consequently, some officials may not support the EMIS if they believe the resulting data are altering their role in the Ministry or limiting the decisions they wish to make. MOE officials will need to be sensitive to these types of issues, particularly during the early stages of EMIS development.

**A Proposal for the Design of an Educational Management  
Information System for the Yemen Ministry of Education**

July, 1986

A proposal developed for  
The Yemen Ministry of Education  
in collaboration with USAID/Yemen and  
The Improving the Efficiency of Education  
Systems (IEES) Project

The education system in Yemen is in a period of rapid expansion. Since 1980, school enrollments have increased over 235 percent and are expected to increase by another 152 percent by the end of the decade. Such rapid expansion poses a challenge to the MOE in monitoring current activities and planning for future growth. Indeed, one constraint on development of the education system is the limited ability of the MOE to obtain and use current information for educational planning.

The MOE recognizes the need for more timely, accurate, and usable information to support planning and administrative decision making. This paper proposes the design of an education management information system for the MOE and suggests how it can be used to improve educational planning and efficiency. It is intended to serve as a working paper for senior Ministry officials who are planning the EMIS, staff members who will be assigned to the EMIS, and donor groups assisting the MOE in this area. The paper was prepared by consultants from the Improving the Efficiency of Education Systems (IEES) Project working with senior staff of the MOE as part of an ongoing collaboration between USAID/Yemen and the Yemen MOE.

**Overview of a computer based educational management information system**

An EMIS is an overall system for providing relevant and timely information to ministry officials. An EMIS consists of five components: (1) a specification of data needs and selection of appropriate indicators; (2) a procedure for collecting, coding, and storing the data; (3) a computer system (the computers and the computer programs) capable of analyzing the data; (4) personnel trained to operate the computer and the computer programs; and (5) personnel who can interpret the information after it has been analyzed and relate the results back to the questions and policy issues under discussion. If any one of these components is missing, the usefulness of the EMIS will be severely limited and the effort to develop it will be wasted.

The paper is divided into seven parts:

- Part 1 reviews the recent progress of the MOE in collecting and using educational information.
- Part 2 discusses key educational policy issues facing the Ministry as a means of identifying the types of educational data that are most important for the Ministry to collect.
- Part 3 describes the education data currently available, assesses the strengths and weaknesses of those data sets and suggests what additional types of data may be important to collect.
- Part 4 outlines procedures for collection and entry of data in the proposed EMIS.
- Part 5 discusses the physical setup and operation of the computer system and the training needs of the EMIS staff.
- Part 6 suggests strategy for undertaking analysis, interpretation, and reporting of data.
- Part 7 proposes a checklist for monitoring data collection and entry activities.

#### **Part 1: Recent Progress of the MOE in Collecting and Using Educational Information**

Over the last two years the MOE has made important progress in developing an educational data base:

1. The EHR Sector Assessment consolidated and interpreted information from across the Ministry of Education. It provides a source of historical and baseline data for use in educational decision making.
2. Efforts continue within the Ministry to consolidate responsibility for data collection and analysis in the Department of Planning and Statistics. Previously, each General Directorate was responsible for collection of data relevant to its own activities. Consolidation of data increases the likelihood that data from different subsectors of the MOE can be analyzed together.
3. The MOE, with the assistance of USAID, will install three IBM compatible microcomputers. Up to this point, the MOE has not had a computer capacity in its management information system.
4. During July, 1986, six staff members from the MOE and the ERDC currently attended a workshop on data coding and computer entry offered in Albany, New York through the IEES Project. These participants have introductory skills in the operation of microcomputer hardware and selected software.

5. The ERDC currently is conducting a national school location and facilities (SLF) study which will provide additional data about school enrollments, staffing, facilities, and educational costs. The data were collected by site visit teams to help ensure the validity of the information collected.

6. The ERDC has ordered an IBM compatible mini-computer which will be used in the analysis of the SLF data.

7. Substantial analysis of recent enrollment, staffing, and facilities data had been undertaken as part of the development of the Third Five Year Plan. In addition to providing important analysis for long term planning, work with this data has helped ministry officials identify the types of data they find most useful in planning and the reporting formats they find most helpful.

While notable progress has been achieved, the MOE recognizes the need to extend and improve its procedures for data collection, analysis and use. At present, the ability of the MOE to obtain and use current, accurate and reliable information in educational planning is limited by three things:

1. Personnel in the schools who are responsible for providing information often make reporting errors. At present, no system is employed to monitor the quality of the data reported by the schools;

2. Data analysis is done by hand. With over 6000 schools, the size of the data set sharply limits the types of analyses that meaningfully can be performed. Even when data is available, it often is not used because it cannot be analyzed quickly or in a manner that responds to the policy questions under discussion.

3. It is not yet clear what types of information (beyond basic enrollment and staffing data) will be most important to collect or how the information should be analyzed and presented to be of the greatest use to Ministry officials. In part, this lack of clarity is because consensus has not yet developed about what educational indicators are most useful in planning or how those indicators will be defined. In part, it is because MOE officials need further experience with different types of data analysis and reporting formats in order to assess which forms of data interpretation and reporting are most useful.

#### Key policy issues facing the MOE

The key policy issues facing the Yemen MOE are related to (1) accommodating the rapid expansion of the education system, (2) providing that access within the budget and fiscal limits posed by constraints on the national budget, and (3) maintaining

and enhancing the quality of the education provided. Each of these is discussed below.

1. Rapid expansion of the education system:

The education system in Yemen is in a period of rapid expansion. Between 1979/80 and 1985/86, primary school enrollments grew from 335,249 to 901,698 students, an increase of 269 percent. The number of primary school teachers jumped from 6,767 to 15,898, an increase of 235 percent. Current enrollment projections suggest that rapid growth will continue. By 1990/91, primary enrollments are expected to reach 1,376,209 students, a 152 percent increase over current 1985/86 enrollments.

This rapid expansion places great pressure on the MOE to provide teachers, facilities, and materials at a rate that accommodates the enrollment growth. Since teacher recruitment, school construction, and educational materials procurement take time, MOE planning efforts must necessarily anticipate and prepare for these types of expansion. Accurate planning must start with data on current levels of enrollment, staffing, and facilities use and reliable population estimates from which to estimate future demand on the educational system.

2. Financial constraints on educational expansion:

During the present decade, the most rapid growth in current government expenditures has been in education. The Sector Assessment estimated that if educational expenditures increase to meet the level of projected demand for education, these expenditures will claim a steadily increasing portion of total government expenditures. If the previous rate of growth continues, by 1992 as much as 45 percent of total recurrent government expenditures would be allocated to education. It is unreasonable to assume that over 40 percent of government expenditures will be allocated to education alone when demand for other social and economic services will be high. Indeed, YARG has already taken steps to reduce the education proportion of recurrent expenditures. National educational expenditures since 1973 have been lower than projected in the Sector Assessment. However, the projection does dramatize the challenge government faces in meeting the impending expansion in demand for educational services.

Government already has implemented plans to limit the growth of recurrent expenditures in this sector. The major increase in recurrent costs has been for teacher salaries. This cost increase has been exacerbated by heavy reliance on expatriate teachers, who are paid more than Yemeni teachers and most of whom are paid by the Yemen government which must draw on hard currency reserves. For example, during 1985/86, 82 percent (17,398 teachers) were expatriates, and while Yemeni teachers receive approximately YR 36,000 annual salary, non-Yemeni teachers receive closer to YR 60,000. Consequently, the increased use of

Yemini teachers would reduce both the recurrent cost of education and the drain on foreign currency reserves.

YARG is exploring ways to reduce the demand on non-Yemini teachers while still responding to the rapid increase in demand for education. Within the last month, a decree was issued which requires up to 50 percent of each year's secondary school graduates to teach for one year after graduation. Analysis of current education statistics suggest that while this policy will slow the increasing dependence on expatriate teachers, it will not reduce the absolute number of non-Yemini teachers needed to meet teacher demand because overall student enrollment is increasing so rapidly.

### 3. Maintaining and enhancing educational quality.

While the priority in Yemen education is quantitative expansion of the education system, the MOE is concerned that educational quality be maintained and eventually increase as enrollment pressures abate. This will require further attention to refinement and implementation of the national curriculum, increased in-service teacher training, and improved testing procedures.

## Part 2: Key Data Needs in the Ministry of Education

Four types of information are of particular importance to the MOE as a basis for planning.

1. The most pressing information need in the MOE is for current, reliable, and accurate information describing the status of the educational system. This includes data on current enrollments and student flow through the system, staffing levels, and facilities use. As this data is collected systematically, summarized, and reported on an annual basis, the yearly reports serve as the basis for monitoring changes and trends in the system and provide much of the data necessary to develop educational and financial projections of future demand.

The MOE currently collects this information on an annual basis. However, its usefulness has been limited by delays in collecting and summarizing the data and the extent to which there are errors in reporting, coding, and computing the statistics.

2. Financial information on the cost of education at each level is necessary in order to more accurately track current costs and how they would be affected by proposed policy changes. Similarly, information on the source and amount of funding for students, teachers, and schools needs to be available for use in examining alternative sources of funding.

3. Current population information is necessary as the basis for more accurately predicting future demand for education, for planning the appropriate location of educational facilities, and for planning the allocation of future educational services. A national census currently is being conducted. However, the ability of the MOE to access and use the census information within its own information system pose technical issues that will require careful planning at an early stage of developing the EMIS.

4. A wider range of indicators of educational quality need to be identified or developed. At present the MOE records examination pass rates for each school. However, student examination scores sometimes reflect social and cultural considerations as well as student performance. Further, the extent to which the examination accurately tests the curriculum or the extent to which the national curriculum is implemented across schools is unclear.

### Part 3: Data Availability and Data Needs of the Ministry of Education

This section describes (1) educational data currently available in the MOE, (2) data that is being collected and will soon be available, and (3) data that currently is not available but which should be collected in the future.

#### Education Data Now Available To The MOE

This section describes data sets currently available to the Ministry of Education. For each data set, the procedures for collecting the data are described and strengths and weaknesses of the data set are discussed. Following that some policy relevant questions that could be addressed using that particular data set are formulated.

#### Ministry of Education Annual Enrollment Survey

The Annual Enrollment Survey consists of four separate survey instruments primary, preparatory, secondary, and teacher training. Across education levels the questionnaires are designed to collect similar data but varies somewhat to address issues of the different levels. The survey is completed by the headmaster or senior teacher, data were received from over 7000 schools.

The surveys collect four types of information about a school:

1. student enrollment
2. level and type of staffing
3. physical condition of school facilities and buildings
4. course offerings

A more complete listing of the variables in each of these categories is presented in Figure I.

#### Collection Procedures:

In November of each school year survey forms are sent to the Governorate Educational Office. They are distributed to the headmaster or senior teacher in each school by Governorate Educational staff. When the forms are completed they are returned to the Governorate Educational Office, stamped and sent to Sana'a. In Sana'a the information for each school is transferred to a coding sheet which is organized by district and Governorate. For each item totals are computed for school, district and Governorate. Results usually are available in January.

#### Strengths:

The information from the Annual Enrollment Survey has three strengths:

1. It provides comprehensive information on basic

enrollment, staffing, and facilities use.

2. The results of the survey are available early enough in the school year to be of use in national and Governorate level planning.
3. The survey provides comparable information across all schools each year.

**Weaknesses:**

The primary weaknesses of the data from this survey are that:

1. Data quality is low. This is caused by (a) failure of school level officials to correctly complete or return the forms, (b) errors in transferring the data to the data summary forms and (c) computational errors in summarizing the data.
2. In 1985/86 data from more than 7000 schools were computed by hand. This made the calculation of crosstabulations and other statistics time consuming and difficult.
3. The survey forms do not collect some types of data that would be useful in current and emerging policy studies. For example, data on the rate of student repetition by grade level is not presently available.

**Analysis:**

Data from the Annual Enrollment Survey responds to several of the four major policy issues which confront the Ministry of Education. Specifically:

1. The data serve as the basis for describing the current status of the education system.
2. The data can serve as the basis of projections of teacher demand. Within the immediate policy environment, these data are the basis for calculating (a) the potential reduction in Non-Yemeni teachers 50% of secondary school graduates are required to teach for one year upon graduation, (b) the potential savings realized through this policy. When analyzed at the district and Governorate level, these data help identify problems in student access and in the equitable distribution of educational services.

The Annual Enrollment Survey forms the basic and most important element in the Educational Management Information System data base. It provides comparable information across all schools and for the same schools across several years. In this respect, it provides essential descriptive information on the status of the educational system. As these data are collected over time they are the basis for identifying and

monitoring trends in the educational system.

However these descriptions and trends are no more trustworthy than the data on which they are based. At present the problems of data quality are severe. In developing the Educational Management Information System, priority should be given to improving the quality of the data collection procedures before increasing the amount of data being collected.

#### Educational Data Expected to be Available Soon

#### NATIONAL CENSUS

Educational projections over the last ten years have relied heavily on the Census of 1975. However the rapid growth of the country and initial inaccuracies of the 1975 data have limited its utility in current planning activities. Data for the census of 1986 now has been collected and is in the process of being coded and analyzed.

#### Collection Procedures:

Primary responsibility for the census data collection has rested with faculty and students from Sana'a University. Students were formed into teams of enumerators and assigned villages to study. The head of a team visited each village one month before collection to meet village leaders, compare the census roster of names with town records and determine the number of shops, industries and establishments. The head enumerator then decided how many team members were needed to collect the data from each town. Teams of enumerators then were sent out to complete a form for each family. There was a data collection window of 17 days. The results were returned to Sana'a where they were coded and entered into a computer. Validation techniques included periodical random checks of the accuracy of the data entered by each key puncher and the use of a software program to validate census information. The data was then prepared for analysis. The entire 1986 analysis is estimated to be completed by March of 1987. However information on Marib, Algoof, and Almahwet Governorates is scheduled to be available by October, 1986.

#### Strengths:

1. The data collection, coding and entry procedures were standardized.
2. Data were collected by trained personnel.
3. There was a two stage process to validate data entry.

#### Weaknesses:

Weaknesses appear to have been minimized by the careful procedures used in data collection, coding, and entry. A more careful assessment of the limitations of the 1986 census await analysis of these data.

### Analysis:

The census does not include many items specifically about education. However it provides population data which can be used to plan for the location of educational facilities and the distribution of services. Of particular importance on educational planning will be statistics on population reported by age cohort, and data on educational level of population by Governorate.

### SCHOOL LOCATION AND FACILITY STUDY

The School Location and Facility Study conducted, by staff of the Educational Research and Development Center (ERDC), is collecting information concerning building conditions, staffing, students and class schedules of all schools in Yemen. The major topical categories in this data set include:

1. general information on school location
2. geographical information
3. construction and state of building repair
4. student distribution
5. student enrollment and flow
6. faculty and staff size, nationality, source of funding and contract period.
7. daily class schedule
8. available equipment
9. students subsidised on board, cash or commodities

Specific variables within these general categories are presented in Figure 2.

### Collection Procedures:

Trained site visit teams were sent to each school. Each team consisted of three people, one from the MOE, one from ERDC, one from the Governorate Educational Office, and one local driver. The driver was employed in each geographical region to help locate the schools. In some cases teams consisted of only two members. Team members completed the Student Location and Facility Questionnaire after interviewing the school personnel.

Presently a code book is being developed by the ERDC. Data coding and transfer is expected to begin in January of 1987. In preparation for data entry, three staff members of the ERDC are being trained in microcomputer use. Further, ERDC has ordered an IBM mini-computer for use in analysis of the data.

### Strengths:

1. Data were recorded by trained personnel who visited each site. Consequently, the data are expected to be more accurate than comparable information collected by the Ministry of Education through the Annual Enrollment Survey.

2. Staff are receiving special training in codebook development and data entry prior to beginning large scale data entry.
3. The questionnaire collected more information about student costs and sources of funding, teacher salaries, and teacher contract periods than is available through the Ministry of Education data.

#### Weaknesses:

1. ERDC has not formulated clear research questions to guide the analysis of the School Location and Facility Study. Consequently it is unclear whether the data will be analyzed and reported in a way that addresses current policy issues in the Ministry.
2. The delays experienced by the ERDC in getting the data collected, coded, entered into the computer and analyzed may limit its usefulness on current policy discussions. The data will be out of date before they are reported.
3. No specific plans yet have been implemented to ensure that the ERDC data uses the same village location coding system developed and used by the census. Without common locations codes, the usefulness of the SLF data for school mapping is severely limited.

#### Analysis:

While the data collection procedures employed by the ERDC suggest the SLF data will be more reliable and of better quality than the MOE data, the delays in analyzing and reporting it and the failure to formulate clear research questions tied to current and emerging policy may limit its usefulness.

#### Additional Data Needs

In general, priority should be given to more complete analysis and interpretation of data already available to the MOE rather than to the collection of new data. However, to respond effectively to several of the current policy issues in education, the MOE may wish to extend its data collection to include three additional types of information.

1. Student repetition rate: At present, no specific information is available on how many students repeat a grade each year. Without this information it is difficult to compute accurate student progression rates and cycle costs at different educational levels. Data on student repetition could be collected through the MOE Annual Enrollment Survey.

2. Unit cost: The MOE needs more accurate information on the unit costs of education by level and how those differ (a) across governorates and (b) between urban and rural areas. Only as this information is available can the Ministry develop more accurate estimates of the financial impact of proposed policy changes.

3. Educational Quality: A longer term agenda for the EMIS is to develop and use more sensitive indicators of educational quality than currently are available. At present, examination pass rates are the primary indicator of student achievement, even though there is evidence that those scores lack reliability. Indicators such as teachers' level of education and experience, amount of contact time between teachers and students, the availability of textbooks and educational materials for each student, and the extent the national curriculum is implemented may offer a wider range of indicators for monitoring educational quality

With the experience gained in the early stages of EMIS development, additional data needs will be identified and procedures to collect those data can be developed.

FIGURE 1: Information Collected in MOE Annual Enrollment Survey

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Information collected about students:

- a. type of school
- b. number of classrooms
- c. types of study shifts
- d. distribution of males and females across classes
- e. new, repeated, and promoted students
- f. number of classrooms
- g. number of chairs
- h. students who eat at school
- i. students who are given money groceries or both

Information collected about staff:

- a. number of teachers, administrators, technical staff and labor.
- b. Yemeni and non-Yemeni personal
- c. number of teachers
- d. number of teachers according to their nationality
- e. number of teachers according to their qualifications
- f. distribution of Yemeni teachers- permanent and on contract
- g. number of administrators at the school including
  - headmaster
  - secretaries
  - librarians
  - custodians
- h. in Teacher Training Institutes
  - distribution of teachers across subjects taught

Information about the school building:

- a. is there a building
  - b. materials of construction
  - c. if no building where does instruction take place
  - d. ownership of building
  - e. condition of the building
  - f. building usage
    - number of rooms for labs, bathrooms and administration
  - g. electricity availability
  - h. other kinds of school activities
    - for example school police instruction
-

**FIGURE 2: Information Collected in ERDC School Location and Facility Study**

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**General information on location:**

- a. name of institute
- b. date of start
- c. place, villiage, province, district

**Geographical information:**

- a. location of school
- b. surrounding location and boundaries
- c. land surrounding the location
- d. ownership
- e. possibilty of expansion
- f. climate
- g. neighboring populstion
- h. general services
  - electricity
  - telephone
  - water

**Construction and state of building repair:**

- a. type of building if any
- b. number of floors
- c. owned or rented
- d. farms attached
- e. uses of open space

**Student distribution:**

- a. section
  - school
  - male
  - female
  - classroom
- b. stage
  - first thru third

**Student flow and enrollment:**

- a. stage
- b. repeaters
- c. years

FIGURE 2: Information Collected in ERDC School Location and Facility Study - Continued

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Staff and labor force:

- a. previous employment
- b. number of classes
- c. previous employment
- d. educational qualifications and date
- e. salary
- f. grade
- g. current job
- h. contract
- i. expatriate
- j. number of children
- k. marital status
- l. gender
- m. nationality
- n. age

Daily class schedule:

- a. stage, section and class
- b. subjects
- c. teacher
- d. number of classes
- e. extra and specialization courses

Available equipment:

- a. usage
- b. condition
- c. type of equipment

Distribution of students:

- a. section
- b. stage
  - first
  - second
  - third
  - total
- c. school
- d. gender
- e. classes

General Condition of School:

- a. windows, floors, walls building materials
- b. sewage, water electricity
- d. fixtures, beds
- e. boards, drawers, tables, chairs

FIGURE 2: Information Collected in ERDC School Location and Facility Study - Continued

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Students on Board/Residence and Food:

- a. residence
  - social activity
  - finance
  - manager
  - number of students
- b. school food
  - supplies
  - cash
  - allowance
- c. labor force in food and residence
  - residence
  - food service
  - supervision
  - health
  - housing
  - food

Non-Yemens to Extend Stay:

- a. name
- b. nationality
- c. current job
- d. period of contract
- e. desired period to stay
- f. same or other school

Additional Expenditures:

- a. foreign assistance
  - b. families
  - c. Father's Council
  - d. student contributions
  - e. school revenue
  - f. contributions and gifts
  - g. yearly total
  - h. number of beneficiaries
-

## Part 4: Collection and Entry of Data

This section discusses strategy for improving data quality, the use of common location codes across different data sets and the need for careful documentation and easy retrieval of codebooks and computer output.

### Strategy for improving data quality:

Low data quality is the primary problem in current MOE data collection efforts. The MOE should emphasize improving the quality of the data it now collects before expanding its data collection activities. The consequences of basing decisions on low quality data is that subsequent analyses will lead to incorrect conclusions.

A key issue in data quality is the development of clear data definitions. Problems stem from two sources:

(a) People providing information do not understand or do not agree on the definition of the data being requested. For example a headmaster asked to indicate the number of students in third grade, may not know whether that means (1) the number of third graders present the day he was filling out the questionnaire, (2) the number of students who started third grade on the first day of school, or (3) the average number that typically attend each day.

(b) Data analysts differ in the way they define and compute technical concepts. Whereas one analyst may compute retention rate to mean progression rate, another may define it to also include repetition rate.

It is important that, as new terms and concepts are introduced, their use is well documented. Results of data analysis forwarded to ministry officials for their use should contain an explanation of how variables and concepts were defined in order to help the user correctly interpret the information.

The development of data definitions and their consistent use across the Ministry should be a priority activity. The EMIS Supervisor should be given responsibility to monitor analyses within the EMIS to ensure that terms and concepts are used within the definitions that have been developed.

The problem of data quality also relates to problems in reporting of data at the school level and verifying the data at all levels. To improve data quality, the MOE could:

(1) provide training to governorate and school level officials on correct procedures for completing questionnaires. The training would help ensure that school personnel were using the same definitions of terms and counting enrollments and staffing in the same way. The training would help emphasize the importance the Ministry attached to receiving accurate data;

(2) institute data verification procedures in which questionnaires are checked for obvious errors before being sent to Sana'a;

(3) employ verification procedures in data entry, in which data entry from a random number of surveys is double checked by a supervisor;

(4) use a systematic data cleaning procedure to identify missing data or out of range numbers. This can be done with the frequencies program in SPSS-PC+; and,

(5) develop a set of incentives to encourage accurate reporting of data. One incentive is to return to each school a computer printout of their enrollment and staffing data for the last three years. This accomplished two things: (a) school personnel receive something tangible for their efforts, and (b) they can identify and report errors that may have occurred in data transfer to the computer.

In addition, the MOE may wish to explore the use of edge coding the Annual Enrollment Survey so that data can be keypunched directly from the questionnaire. Edge coding refers to instructions that are coded along the edge of the questionnaire that instruct the data entry personnel where each item should be punched when it is being entered in the computer. Edge coding improves data quality by reducing the number of times data is transferred during the data entry stage.

#### Use of a Common Location Coding System

The MOE, ERCD and CPO should employ a common village location coding scheme. This coding scheme provides a way to combine data about the same geographical location across different data sets. Such a coding scheme is being developed by CPO as part of the 1986 census. CPO anticipates the full set of codes will be available to MOE by March, 1987. The importance of a common location coding system is discussed below.

A data set, understood within the EMIS, is a set of information about the educational system. For example the

MOE Annual Enrollment Survey, the ERDC School Location and Facilities Study and the 1986 Census are each a data set. A data base consists of several data sets. Within a data base, the data sets sometimes can be combined, if sufficient information exists on which to combine them. For example, the Annual Enrollment Survey contains information about schools in each district and the 1986 census will contain data on the population by age cohort for each district. If the data for each district can be matched with the data for the same district in the census data, important new questions about school location can be answered that could not be answered by either data set alone.

With over 7,000 schools, matching districts by using their name would become very complicated. A more common way to match data is to develop a coding scheme which assigns each district a code number. If both data sets use the same set of district code numbers, data for each district from the two studies can be matched by computer.

Many of the most important questions that MOE officials wish to address require that information from several data sets be combined. For example: (1) Data reported by the same school each year for several years needs to be linked so that trends can be studied and monitored. (2) Data from different studies may need to be linked so that additional questions can be investigated. For example, it may be important to link the SLF data set with the MOE Annual Enrollment Survey data or to combine the census data with both of those data sets.

It is critical then, that the MOE work with other Ministries and agencies to develop a common school code that will be consistently used by the MOE and other Ministries in studies that involve schools. The census bureau in CPO already has a coding scheme that identifies each village in Yemen. An additional 3 digit code could be attached to it to identify specific schools within a village. Use of this code in future MOE data collection activities would expand greatly the power and usefulness of the EMIS.

### Organization of Data Entry

How data is organized for entry to the computer is determined, in large part, by the type of decisions to which the data will contribute. Data can be entered by Governorate (all data from one Governorate is entered before going on to the next Governorate) or by education level (all secondary education data is entered for all Governorates before starting the entry of preparatory or primary level data). In general, it is useful to enter all the data by education level, so that analysis can begin on that level even as data entry for another level is still underway.

This strategy helps improve the timeliness of getting information back to MOE officials. These data sets (by education level) can be combined whenever an overall analysis of the education system is appropriate.

## Part 5: Physical Setup and Operation of a Computer Center

An educational management information system does not require computers--the data could be analyzed by hand. However, as the size of the education system grows and the amount of data increases, computers provide speed and flexibility in data analysis.

In setting up a computer center as part of the EMIS, the MOE will face a series of very practical decisions about the location and operation of the computer equipment. This section discusses five issues: (1) location of computer equipment, (2) location of personnel trained to operate the equipment, (3) the training of personnel, (4) selection of appropriate computer programs to use in doing the analysis, and (5) the reporting structure of the EMIS within the MOE.

1. [REDACTED]

The location of the computer equipment should reflect six considerations:

[REDACTED] Adequate space must be provided for the computers, printers, computer paper and supplies, and personal desk space for the computer operators.

[REDACTED] The computers should be located near each other. Computer operators need to be able to assist each other in solving programming problems.

[REDACTED] Computers are quite sensitive to dust and heat. Particularly in Sanaa, which often is dusty, it is essential that the computers be kept in an air conditioned area and protected from dust and dirt.

[REDACTED] Computers also are sensitive to rough treatment and misuse. Since repairs can be expensive, time consuming, and may cause serious delays in the Ministry's access to information, it is important to house the computers in an area that is secure and protected from persons who are not trained in their use.

[REDACTED] It is important that enough space is provided so that the output (paper on which the results of the analysis are written) can be organized and stored properly to ensure that it can be located quickly when it is needed by an MOE official.

[REDACTED] Operating a computer often requires concentration. Frequent interruptions of the computer operator can lead to errors. The space should allow for some privacy by limiting the access of people to the computer work area.

## 2. Location of personnel

The people trained to operate the EMIS should be located near one another. As individuals increase their skills in operating the computers and in working with particular computer programs, they should be immediately available to assist each other with questions or problems that arise in operation of equipment or formulation of an analysis.

The MOE central offices are already overcrowded and adequate space for a computer center may be difficult to locate in that office area. One possibility is to locate the computer center at the ERDC. Four reasons support this possibility:

- (1) Adequate space is available and could be air conditioned and secured at less expense than space in the MOE.
- (2) The MOE and the ERDC computer staffs would be in close proximity and could assist each other in solving technical problems.
- (3) The proximity could help ensure that computer personnel in the MOE and ERDC are aware of how each group is coding data, defining variables, and formulating data analyses.
- (4) The proximity of MOE and ERDC personnel will help encourage collaboration between groups. In addition, as the MOE data base grows, it may be desirable to run some analysis on the larger ERDC computer.

## 3. Selection of computer programs

Computer programs are written in "machine language" (such as BASIC or FORTRAN) which instructs the computer to perform specific operations. Computer programs to analyze data can be written in these machine languages. However, if the same types of analysis (such as frequencies or cross-tabulations) are used frequently, it is not efficient to create a computer program in machine language each time. Consequently, many companies have developed commercial programs in which the machine language for particular types of analysis have already been prepared. The user only needs to add the appropriate data and instruct the packaged program on which analysis is desired.

The EMIS should rely on these commercially available programs. At this point in development of the MOE data system, all data analysis needs of the MOE can be met through the use of commercial programs. Further, staff can learn to run commercial programs much more easily than machine language programs. It is not necessary for an EMIS staff member to know machine language programming to be able to compute the statistics the MOE needs for planning.

The choice of which computer programs to use is an important decision for the MOE. Many commercial programs for word processing, data analysis, and data management are available commercially. They differ in their ease of use, cost, and the amount of data they will handle. Several different commercial programs are available to do the type of analyses the MOE needs to conduct. However, if different staff members use different programs, three problems result:

- (1) Staff members are not able to help each other solve problems if they are not familiar with each other's programs.
- (2) Data sets may be developed and formatted for different programs making it difficult to combine data sets or run summary analyses.
- (3) If EMIS staff leave their Ministry job, the data analysis on which they were working cannot easily be picked up by other staff members.

Staff should be encouraged to experiment with other computer programs, but official work should be limited to those selected for Ministry use. Changing computer programs often requires considerable time and expense for training of personnel and re-entry of data in the new programs. Consequently, the computer programs used by the MOE should be changed only after careful testing and consideration of the new program.

Particularly during the first few years of implementation, the EMIS should employ only a small number of commercial programs and all computer staff members should become proficient in these programs. Two commercial programs appear to have particular advantages for the MOE.

ENABLE: this program consists of five subprograms:

- spreadsheet analysis - used to analyze columns and rows of numbers. This is similar to the computer program Dr. Strudwick used to summarize the 1985/86 school enrollment data.
- data management - used to organize and move data files (for example, it could be used to identify those district which had student attrition rates higher than the national average).
- graphics - used to develop charts and graphs to assist in reporting results.
- word processing - used to write reports and text in English.
- spelling checker - checks spelling of English text and identifies misspelled words.

Enable has four particular advantages for use in Yemen.

1. The subprograms are "integrated". That means, for example, that a chart developed in the graphics program can be inserted into text being written with the word processing program or that a graph can be developed from data in the spreadsheet program.
2. The program has five of the most frequently used analysis and processing activities. It is more efficient to learn than having to learn five separate programs to accomplish the same functions.
3. The spreadsheet analysis within ENABLE can be used for the analysis of school enrollment data within each school year.
4. The word processing program of ENABLE can be used to create data files for use with SPSS-PC+.

SPSS-PC+: This program is specially designed for statistical analysis of data using a micro-computer. It offers a wide range of statistical techniques appropriate for analyzing large and somewhat complex data sets.

SPSS-PC+ is easy to use and offers a wide range of statistical techniques. It is already being used by the government and donor agencies (i.e., CPO and USAID). Its primary use with the Yemen MOE data is for computing trends in the data from schools, districts, and Governorates over several years. These types of analyses require that school, district, and Governorate data from several years be linked together and measures of change over time be computed. For example, SPSS-PC+ would be useful for computing examination pass rates for each Governorate over a five year period and computing cycle cost for each year based on those pass rates.

SPSS-PC+ is particularly appropriate for data sets such as the School Location and Facilities study being conducted by the ERDC, where the interest is in investigating relationships among variables (or sets of variables) as opposed to developing frequency counts of the number of persons within categories.

In addition to ENABLE and SPSS-PC+, the MOE should explore the availability of commercial word processing programs in Arabic. Arabic word processing programs can be used on the IBM microcomputers and would assist the MOE in report preparation and manuscript development.

#### 4. The Training of Personnel

Successful operation of an EMIS requires that at least four skills be represented across the staff: (a) conceptualizing the data needs and developing the mechanisms to collect the desired data, (b) data coding and entry skills, (c) the operation of

computer equipment and commercial software, and (d) the interpretation of data. Ideally, all personnel operating the EMIS have all these skills. However, it often is necessary to introduce some degree of specialization in order to more efficiently target training opportunities. It is possible, for example, that a person could operate the computer and selected computer programs without being an expert in interpreting the results. Nonetheless, some knowledge of each activity is helpful so that, for example, a computer operator would realize if an analysis was not computing correctly.

At present, the senior ministry staff do most of their own interpretation of the data provided by the Department of Statistics and Planning. However, as the size and complexity of the data base increases and the types of analyses become more technical, senior MOE staff may need to delegate more of the interpretation activity to staff members. To do this successfully requires three things:

- (1) staff trained to perform this type of function,
- (2) incentives to keep them at the MOE, and
- (3) senior staff willing to include these persons at sufficiently high levels of policy discussions and debate for the analysts to understand what types of analysis and data presentations are most useful to the decision process.

It is expected that the full staffing of the EMIS will be developed over several years. Personnel with the following skills will be needed:

- data collectors and verifiers
- data coders
- data entry personnel
- data analysis I -trained to handle routine data cleaning and analyses.
- data analysts II -trained to merge data sets from different years and to conduct analyses to identify and monitor trends.
- data analysts III-trained to develop educational projections and conduct policy analysis.
- EMIS supervisor -responsible for the overall flow of work and for setting priorities for data analysis.

Training in the operation of microcomputers and selected computer programs can be conducted effectively through a series of short training courses. Whenever possible, these should be conducted in Yemen using the computers in the MOE. This strategy makes it possible for more Ministry staff to participate in the

training and reduces problems trainees sometimes have in transferring their training from one type of microcomputer to another.

Some training can also be provided through in-service-training as EMIS staff work closely with senior ministry officials. This will be especially important during the early stages of EMIS development. However, on-the-job training cannot replace the need for formal training in the latest planning and research methods. Consequently, selected MOE staff should be sent for training in planning, statistics, and policy analysis. These skills emphasize the use of data and analysis in decision making. Following training, these staff members should move into positions within the MOE where they can help identify and formulate the data needs related to larger policy issues, select and develop the appropriate type of data analysis, and interpret the results in a manner that ties the data back to the policy issues under discussion.

While a continued program of staff training will be important to the continued development of trained EMIS staff, retention of those personnel with training and experience will also be important. Personnel with computer skills will have many job opportunities available to them and keeping them in the MOE will require an effective incentive system.

## 5. Reporting Structure of the EMIS within the MOE

The EMIS will be an activity located in the Department of Planning and Statistics within the Directorate of Technical Services. However, it is expected that the Director of the EMIS will work closely with the Deputy Minister in the definition of data needs, choice of analysis, and selection of reporting formats. Requests from other Directorates for information from the EMIS are expected to go through the Deputy Minister. It is recommended that the General Directors meet as a group to evaluate the usefulness, accuracy, and timeliness of the information they receive from the EMIS system and develop specific procedures for improving the usefulness of the system.

At present, responsibility for the collection and analysis of educational data is spread across several agencies (MOE, ERCD, CPO). To address some of the more important policy issues facing the MOE will require the use of data from sources other than the MOE's own data collection efforts. The mechanisms to encourage and support this type of sharing have not been fully developed yet. Consequently, policy decisions will need to be made in the MOE and other ministries that encourage sharing of data sets and use of common locational coding schemes.

## Part 6: Analysis, Interpretation and Reporting of Data

In order to conduct the appropriate analysis, EMIS staff have to understand what policy issues are being discussed and how the data are to be used. However, even the best analysis is of little use to MOE officials unless the information is clearly and correctly interpreted and reported in an appropriate manner.

At present the MOE conducts primarily (1) descriptive data analysis which emphasize frequency counts of the number of students, teachers and facilities and (2) selected cross-tabulations (such as the number of Yemeni and non-Yemeni teachers by governorate). Once data are computerized, these same analyses can be conducted with greater speed and flexibility than at present. For example, as new data are received or old data are revised, totals can be recalculated quickly. However, the computer also allows easy computation of information that would be difficult and time consuming to calculate by hand, for example, changes in school enrollment by gender for each governorate over a three year period, or the relationship of textbook availability to examination pass rates in each governorate.

One risk in the early stages of an EMIS is that the system is overwhelmed by requests for new and different types of data analysis. Consequently, it will be important that a clear mechanism for setting priorities for data analysis is established. The criteria for determining access and priority might include:

1. how clearly the data analysis is related to policy issues under discussion;
2. the time frame in which the information is required;
3. the ability of the official requesting the analysis to interpret and use the results; and,
4. the amount of staff and computer time that will be tied up in conducting the analysis.

At early stages of an EMIS, priority should be given to extending the descriptive data base about the MOE. Only as computer operators become experienced in using the computer and as staff trained in statistics and planning are available should the EMIS move to more complex analyses.

### Types of Analysis

The type of analysis is determined by how the data will be used. The proposed EMIS will have three primary uses in the Ministry of Education: (1) to describe the education system, (2) to identify and monitor trends in enrollment, staffing and facilities and (3) to develop projections of the cost and financing and the supply and demand of educational services.

## Describing the Educational System

A descriptive analysis of annual education data should be conducted each year. The data for this analysis will be collected through the Annual Enrollment Survey which is received in the Ministry in January - March of each year. This analysis will provide information on student enrollment, number of classrooms, level of staffing and facilities use by district, governorate, and nationally. This data can be analyzed and reported by grade level and by subcategories of variables (such as boys and girls, Yemeni and non-Yemeni teachers, etc.). This analysis can be done with the spreadsheet and data management programs within ENABLE.

## Identifying and Monitoring Trends

As comparable information about the education system is collected each year, it will be possible to identify the direction and magnitude of changes in the educational system. This analysis requires that data from the Annual Enrollment Survey each year be combined with the enrollment data from previous years so that changes in enrollment, staffing, and facilities use can be identified and monitored. This activity requires staff with more advanced computer skills since this analysis will require the use of both ENABLE and SPSS-PC+. Staff will also need to understand basic statistics in order to analyze the change across years.

## Developing Projections

The MOE and other ministries currently are making decisions about the number of teachers, facilities, and supplies that will be needed over the next twenty years. Data from the EMIS can serve as the basis of these types of projections. Further, the system allows Ministry officials to test different policy options by analyzing national data as if a particular policy had already been put into effect. For example, the 1985/86 MOE school enrollment and staffing data were used to examine how much money would be saved in expatriate teacher salaries if half of the secondary school graduates taught for a year following graduation. This type of analysis is called a simulation--the data already available are used to "simulate" the effects of a policy before the policy is really implemented. For example, student enrollment data, examination pass rates, and educational expenditure data can be use to test how cycle cost would be affected if the examination pass rate were to drop by five percent. Simulations help policy makers examine potential trade-offs to more fully understand how proposed policies might affect the system. Developing cost and enrollment projections will require advanced computer skills and considerable training in statistics and planning.

## Interpretation of Data

Proper interpretation is often the stumbling block of an information system. The experience in other developing countries is that large amounts of data collected for an information system are either never processed or the analyses are never fully examined and interpreted. This suggests that to avoid wasting resources, a critical assessment of the capability to analyze and interpret the data by the time it is needed by MOE officials should be a primary criterion to decide what type and amount of data should be collected.

Interpretation of data should emphasize common sense and logical reasoning, rather than more complex statistical procedures.

Initially, MOE senior officials probably will continue to interpret the data they need in their planning and policy discussions. As the volume and complexity of the analyses increase, the MOE may wish to have EMIS staff specially trained in planning, statistics, and policy analysis assist in the interpretation of data.

## Reporting

Data should continue to be reported in forms in which the MOE staff is already familiar. Presentation of results in tables is most widely understood and, for that reason, is most useful. However, EMIS staff should be encouraged to develop charts and graphs using ENABLE and SPSS-PC+ that can help illustrate the tabular material. It is important that data analysts realize that the same data can be presented in several different ways-- the choice is one the user should make.

All tables, charts and graphs should be accompanied by a narrative which explains (1) what data base was used in the analysis, (2) what analysis was employed, (3) when the analysis was conducted, (4) any special information about the way the variables were defined, and (5) any assumptions that might have been employed in the analysis. For example, an enrollment projection for primary school might have been based on an assumption of a ten percent student attrition each year.

An important part of reporting is the ability for information retrieval. The EMIS should maintain a library of all codebooks and final computer analysis for each data set. All documentation necessary to allow a new user to examine output and be able to understand the data set used, the type of analysis employed, the specific manner in which variables were defined and coded, and the results that were obtained in the analysis should be available. Only in this way can the MOE develop a cumulative data base.

## Distribution of Information from the EMIS

The MOE should develop policy regarding the distribution of results of routine analysis. It is recommended that most routine analysis (e.g., school enrollment, staffing, and facilities use data) be given wide distribution within the MOE so that MOE officials are all working from the same education statistics. All reports should be clearly dated to help avoid confusion if revised statistics are released when more data is received or errors are corrected.

In addition, the MOE will need to devise policy regarding the distribution of educational statistics and data analyses to individuals and groups outside the Ministry. For example, over time the EMIS will become an important resource for researchers. While the first priority of the EMIS is to provide accurate and timely information to Ministry officials, policies and strategy for allowing researchers access to the education data base can contribute to the long term development of the education system.

## Organizational Issues

The development of the EMIS can give the MOE more reliable, accurate, and timely data to use in education policy development. However, data can also limit choices. The availability of data can constrain decisions based on political or social considerations as people are forced to defend their decision on more objective grounds. Consequently, some officials may not support the EMIS if they believe the resulting data are altering their role in the Ministry or limiting the decisions they wish to make. MOE officials will need to be sensitive to these types of issues, particularly during the early stages of EMIS development.

## Part 7: Proposed Checklist for Monitoring Data Collection, Entry, Analysis, and Reporting Activities

The following questions may be helpful as part of a checklist that the EMIS Supervisor could use in reviewing preparations for data collection, entry and analysis activities of the EMIS. Additional questions should be developed by EMIS staff based on their experience and the specific procedures to be employed in the data collection and analysis.

### Selection of information to be collected

Does the information being collected relate to policy issues being addressed in the Ministry?

Is the desired information already available somewhere else in the Ministry?

Do respondents have sufficient knowledge to be able to provide the information requested?

### Design and formatting of data collection instrument

Are terms on the questionnaire clearly defined?

Are items clearly stated?

Are instructions for completing the questionnaire clearly stated?

Is the format of the questionnaire set up for easy coding?

Is the data set designed to use a common village location coding system?

### Techniques for improving data quality

Do Governorate Education Staff understand how to check questionnaires for accuracy and completeness?

Are responses to the questionnaire checked for completeness and accuracy before being sent to Sana'a?

If data are transferred from the questionnaire to a coding sheet, are people doing the transferring trained to do this?

Has a complete codebook been developed to assist in data entry to the computer?

Are random checks made of accuracy of data coding?

Are coding errors corrected when they are identified?

Are data coders who make repeated errors sent for further training or transferred to other jobs?

Once the data is entered into the computer, are missing and out-of-range variables identified using a frequencies program?

Are corrections made for missing and out-of-range variables?

#### Conduct of data analysis

Are duplicate disks of data made for all data sets?

Are computer programmers and operators adequately trained in operation of the programs and equipment they will be using?

Are computer programs correctly prepared and run?

Is the workspace set up so that computer programmers and operators can solicit advice and assistance from other programmers and operators?

Are special data definitions, coding decisions, and assumptions associated with each analysis clearly documented and attached to the data output for that analysis?

Is adequate attention given to examining the information available from an analysis before additional analyses are requested?

Are results promptly distributed to appropriate MOE officials?

Is an EMIS staff member available to assist Ministry officials interpret computer output, if such assistance is desired?

Are copies of all codebooks and final computer output filed in the EMIS for easy future retrieval?

## SUMMARY

### A Proposal for the Design of an Educational Management Information System for the Yemen Ministry of Education

July, 1986

A proposal developed for  
The Yemen Ministry of Education  
in collaboration with USAID/Yemen and  
The Improving the Efficiency of Education  
Systems (IEES) Project

This paper proposes the design of an education management information system (EMIS) for the MOE and suggests how it can be used to improve educational planning and efficiency. It is intended to serve as a working paper for senior Ministry officials who are planning the EMIS, staff members who will be assigned to the EMIS, and donor groups assisting the MOE in this area.

#### Overview of a computer based educational management information system

An educational management information system (EMIS) is an overall system for providing relevant and timely information to ministry officials. An EMIS consists of five components:

- (1) a specification of data needs and selection of appropriate indicators;
- (2) a procedure for collecting, coding, and storing the data;
- (3) a computer system (the computers and the computer programs, called "software") capable of analyzing the data;
- (4) personnel trained to operate the computer and the computer software; and
- (5) personnel who can interpret the information after it has been analyzed and relate the results back to the questions and policy issues under discussion.

If any one of these components is missing, the usefulness of the EMIS will be severely limited and the effort to develop it will be wasted.

#### Recent Progress of the MOE in Collecting and Using Educational Information

Over the last two years the MOE has made important progress in developing an educational data base:

1. The EHR Sector Assessment consolidated and interpreted information from across the Ministry of Education.

2. Efforts continue within the Ministry to consolidate responsibility for data collection and analysis in the Department of Planning and Statistics.

3. The MOE, with the assistance of USAID, will install three IBM compatible microcomputers.

4. During July, 1986, six staff members from the MOE and the ERDC currently attended a workshop on data coding and computer entry.

5. The ERDC currently is conducting a national school location and facilities (SLF) study which will provide additional data about school enrollments, staffing, facilities, and educational costs.

6. The ERDC has ordered an IBM compatible mini-computer which will be used in the analysis of the SLF data.

7. Substantial analysis of recent enrollment, staffing, and facilities data had been undertaken as part of the development of the Third Five Year Plan.

At present, the ability of the MOE to obtain and use current, accurate and reliable information in educational planning is limited by three things:

1. Personnel in the schools who are responsible for providing information often make reporting errors. At present, no system is employed to monitor the quality of the data reported by the schools.

2. Data analysis is done by hand. With over 6000 schools, the size of the data set sharply limits the types of analysis that can be meaningfully performed. Even when data is available, it often is not used because it cannot be analyzed quickly or in a manner that responds to the policy questions under discussion.

3. It is not yet clear what types of information (beyond basic enrollment and staffing data) will be most important to collect or how the information should be analyzed and presented to be of the greatest use to Ministry officials.

The MOE has identified four types of information are of particular importance to the MOE as a basis for planning.

1. The most pressing information need in the MOE is for current, reliable, and accurate information describing the status of the educational system.

2. Financial information on the cost of education at each level is necessary in order to more accurately track current costs and how they would be affected by proposed policy changes.

3. Current population information is necessary as the basis for more accurately predicting future demand for education, for planning the appropriate location of educational facilities, and for planning the allocation of future educational services.

4. A wider range of indicators of educational quality need to be identified or developed.

### Physical Setup and Operation of a Computer Center

The location of the computer equipment should reflect six considerations:

(a) Adequate space must be provided for the computers, printers, computer paper and supplies, and for the computer operators.

(b) The computers should be located near each other. Computer operators need to be able to assist each other in solving programming problems.

(c) Computers are sensitive to dust and heat. It is essential that the computers be kept in an air conditioned area and protected from dust and dirt.

(d) Computers also are sensitive to rough treatment and misuse. It is important to house the computers in an area that is secure and protected from persons not trained in their use.

(e) Enough space should be provided so that the output (paper on which the results of the analysis are written) can be organized and stored properly to ensure that it can be located quickly when it is needed by an MOE official.

(f) Operating a computer often requires concentration. The space should allow for privacy by limiting the access of people to the computer work area.

### Location of personnel

(a) The people trained to operate the EMIS should be located near one another to assist each other with questions or problems that arise in operation of equipment or formulation of an analysis.

(B) The MOE should consider locating the EMIS in the ERDC. The MOE central offices are already overcrowded and adequate space for a computer center may be difficult to locate in that office area. Adequate space is available and could be air conditioned and secured at less expense than space in the MOE. Further, the MOE and the ERDC computers staffs would be in close proximity and could assist each other in solving technical problems. The proximity could help ensure that computer personnel in the MOE and ERDC are aware of how each group is coding data, defining variables, and formulating data analysis. Also, the proximity of MOE and ERDC personnel will help encourage collaboration between groups.

### **The Training of Personnel**

Successful operation of an EMIS require at least four skills: (a) conceptualizing the data needs and developing the mechanisms to collect the desired data, (b) data coding and entry skills, (c) the operation of computer equipment and commercial software, and (d) the interpretation of data.

Training in the operation of microcomputers and selected computer programs can be conducted effectively through a series of short training courses. Whenever possible, these should be conducted in Yemen using the equipment in the MOE. This strategy makes it possible for more Ministry staff to participate in the training and reduces problems trainees sometimes have in transferring their training from one type of microcomputer to another.

In addition to training in operating a computer, selected MOE staff should be sent for long-term training in planning, statistics, and policy analysis. Following training, these staff members should move into positions within the MOE where they can help identify and formulate the data needs related to larger policy issues, select and develop the appropriate type of data analysis, and interpret the results in a manner that ties the data back to the policy issues under discussion.

While a continued program of staff training will be important to the continued development of trained EMIS staff, retention of those personnel with training and experience will also be important. Personnel with computer skills will have many job opportunities available to them and keeping them in the MOE will require an effective incentive system.

### **Selection of computer programs**

The EMIS should rely on commercially available programs. At this point in development of the MOE data system, all data

analysis needs of the MOE can be met through the use of commercial programs. Further, staff can learn to run commercial programs much more easily than machine language programs. It is not necessary for an EMIS staff member to know machine language programming to be able to compute the statistics the MOE needs for planning.

Particularly during the first few years of implementation, the EMIS should employ only a small number of commercial programs and all computer staff members should become proficient in those programs. The use of too many different programs leads to three problems:

- (1) Staff members are not able to help each other solve problems if they are not familiar with each other's programs.
- (2) Data sets may be developed and formatted for different programs making it difficult to combine data sets or run summary analyses.
- (3) If EMIS staff leave their Ministry job, the data analysis on which they were working cannot easily be picked up by other staff members.

Staff should be encouraged to experiment with other computer programs, but official work should be limited to those selected for Ministry use.

Two commercial programs appear to have particular advantages for the MOE.

ENABLE: this program consists of five subprograms:

- spreadsheet analysis - used to analyze columns and rows of numbers.
- data management - used to organize and move data files.
- graphics - used to develop charts and graphs.
- word processing - used to write reports and text in English.
- spelling checker - checks spelling of English text and identifies misspelled words.

The particular advantages of ENABLE are discussed in the longer paper.

SPSS-PC+: This program is specially designed for statistical analysis of data using a micro-computer. It offers a wide range of statistical techniques appropriate for analyzing large and somewhat complex data sets. SPSS-PC+ is easy to use and offers a wide range of statistical techniques. Its primary use with the Yemen MOE data is for computing trends in the data from schools, districts, and Governorate over several years.

In addition to ENABLE and SPSS-PC+, the MOE should explore the availability of commercial word processing programs in Arabic.

### Sources of Data for the EMIS

Three data sets form the core data for the EMIS: the annual school enrollment survey conducted by the MOE, the School Location and Facilities Study conducted by the ERDC, and the 1986 census, available from CPO.

### Collection of Data

Low data quality is the primary problem in current MOE data collection efforts. The MOE should emphasize improving the quality of the data it now collects rather than expanding its data collection activities.

To improve data quality, the MOE should

- (1) provide training to governorate and school level officials on correct procedures for completing questionnaires;
- (2) institute data verification procedures in which questionnaires are checked for obvious errors before being sent to Sanaa;
- (3) employ verification procedures in data entry, in which data entry from a random number of surveys is double checked; and
- (4) use a systematic data cleaning procedure to identify and adjust for missing data or out of range numbers.

In addition, the MOE may wish to explore the use of edge coding the Annual Enrollment Survey so that data can be keypunched directly from the questionnaire. Edge coding improves data quality by reducing the number of times data is transferred during the data entry stage. These procedures are discussed in the full paper.

The MOE, ERCD and CPO should employ a common village location coding scheme. This coding scheme provides a way to combine data about the same geographical location across different data sets.

### Analysis, Interpretation, and Reporting of Data

The type of analysis is determined by how the data will be used. The proposed EMIS will have three primary uses in the MOE.

1. To describe the education system.

The descriptive analysis draws on data from the annual enrollment survey conducted by the MOE.

2. To identify and monitor trends in enrollment, staffing, facilities use, and costs.

As comparable information about the educational system is collected each year, it will be possible to identify the direction and magnitude of changes in the educational system.

3. To develop projects of educational costs and financing and the supply and demand of educational services.

Data on recent trends can be combined to develop projections of future events within the education sector.

At early stages of development of the EMIS, priority should be given:

(1) to analysis of data already collected by the Ministry, ERDC, and CFO rather than collection of additional types of data;

(2) to further descriptive analysis of the data base provided by the Annual Enrollment Survey;

Only as the data quality improves, as computer operators become experienced in using the computer, and as staff trained in statistics and planning are available should the EMIS move to more complex analyses.

(3) to identifying trends over time by combining comparable district, governorate, and national level data over time.

### **Interpretation of Data**

Interpretation of data should emphasize common sense and logical reasoning. Its role is to relate the results of data analysis back to the policy discussions in the ministry

### **Reporting Results**

Data should continue to be reported in forms in which the MOE staff is already familiar. Presentation of results in tables is widely understood and, for that reason, most useful. All tables and charts should have the source of data, type of analysis, data definitions, and assumptions of the analysis well documented.

### **Documentation**

The EMIS should maintain a library of all codebooks and final computer analysis for each data set.

### **Distribution of Information from the EMIS**

The MOE should develop policy regarding the distribution of results of routine analysis. It is recommended that most routine analysis (e.g., school enrollments, staffing, and facilities use) be given wide distribution within the MOE so that MOE officials are all working from the same educational statistics.

### **Organizational Issues**

The development of the EMIS can give the MOE more reliable, accurate, and timely data to use in education policy development. However, data can also limit choices. They can constrain decisions based on political or social considerations by forcing people to defend their decisions on more objective grounds. Consequently, some officials may not support the EMIS if they believe the resulting data are altering their role in the Ministry or limiting the decisions they wish to make. MOE officials will need to be sensitive to these types of issues, particularly during the early stages of EMIS development.

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( ٣ ) نظام كمبيوتر ( معدات الكمبيوتر . . . و برامج الكمبيوتر . . . وتسمى  
"الوسائل المنوية" ) تادرطى تحليل المعطيات .

( ٤ ) موظفين تدريبين طسى تشغيل الكمبيوتر و برامج الكمبيوتر .

( ٥ ) موظفون تادرون طسى ترجمة المعلومات بمعد أن يتم تحليلها  
وأحالتها مرة ثانية الى السائل التعلقه بالمواضيع والسياسة الموضوعه  
للنقاش .

فسي حالة فقدان أى من العناصر المذكوره أعلاه . . . فأن ذلك سيؤثر كبير  
طسى نظام معلومات إدارة التعلسم . . . وتذهب الجهود التى بذلت لأنشائه  
هيا .

التقدم الطوس مؤخرًا فسي وزارة التربيه والتعلسم بجمال تعميل وأستخدام -  
المعلومات التعلبيه .

حققت وزارة التربيه والتعلسم خلال السنتين الأخيره تقدما عظيما فسي أنشائه  
أسمى معطيات تعلبيه :-

( ١ ) تمام فريق تقييم قطاع التعلسم والوارد البشره بتوجيه و برجة  
المعلومات من خلال وزارة التربيه والتعلسم .

( ٢ ) استمرار الجهود فسي نطاق الوزارة لضم مسئولين تعميل وتحليل المعطيات -  
فسي إدارة التخطيط والأعمال

( ٣ ) تقويم الوزارة بالتعاون مع الوكالة الأمريكية بتركيب ثلاثة أجهزة كمبيوتر  
دقيق وملائمه من طراز آى . سي . أم .

( ٤ ) خلال يوليو ١٩٨٦ م . . حضرا ستة موظفين من وزارة التربيه والتعلسم  
و مركز تطوير التعلسم والبحوث . . حالها . . خلقه دراسه حول أطبائه  
رسوز المعطيات وتلقسم الكمبيوتر .

- ( ٥ ) بجرى مركز تطوير التعليم والبحث .. حاليا دراسته حول إتساع ورافق المدارس في الجمهورية .. والتي ستوفر لنا معطيات أضافية حول التوظيف في المدارس ... والموظفين والمرافق ... وكذلك التكاليف التعليمية
- ( ٦ ) تمام المركز بطلب كمبيوتر حفر ثلاث من طراز آي . بي . أم . والذي سيتم استخدامه في المعطيات الخاصة بواقع ومرافق المدارس .
- ( ٧ ) لقد تم الشروع في عمل تعاليل جوهريه للمعطيات التسجيل حد بشـ والتوظيف والمرافق ... وذلك جزء من عملية الخطه الخمسه الثالثه .
- حاليا ... تنحصر وبع الوزارة في الحصول وأستخدام معلومات جاريه ودقيقه و موثوقه لغرض تخطيط التعليم على ثلاثة أسور :-
- ( ١ ) الموظفين في المدارس .. الذين تقع عليهم مسئولية توفير المعلومات .. قال فأنهم يرتكبون أخطاء في تقاريرهم .. حاليا لا يوجد هناك أي نظام لراقبه نوعية المعطيات التي تقدمها المدارس .
- ( ٢ ) تامل تعاليل المعطيات بدوها .. وبوجود ما يزيد على ( ٦٠٠٠ ) مدرسه فأن حجم ركيزة المعطيات تعد بشده على نوعية التعاليل الست يمكن القيام بها بشكل ذودلالة كامله ... وحتى عند ما تكون الجهه ما تتوفر .. فأنها غالباً لا تستخدم حيث وأنه من الصعب القيام بتحليلها بالمره المطلوبه أو على الشكل الذي يتلائم مع سائل السامه المطلوبه في النقاش .
- ( ٣ ) لأزال فسر واضح لنا ما هي أنواع المعلومات ( باستثناء المعطيات الأمامه للتسجيل والتوظيف ) . التي ستكون أكثر أهميه لتحليلها وكيف سيتم عمل تحليل المعلومات وتقدمها لتكون ذات فائده كبيره للمسؤولين في الوزارة أن المعلومات المطلوبه بشكل طبع للغاية في إدارة الترميم والتعليم هي الحصول على معلومات جاريه و موثوقه ودقيقه التي تعف حالة نظام التعليم .

من الضروري الحصول على معلومات مالية بالنسبة لتكاليف التعليم و بحسب كل مرحلة  
يفرض متابعة التكاليف الجارية بدقة أكثر وكيفية التأثير عليها بالتغيرات المقترحة للسياسة

- من الضروري الحصول على معلومات حاله بالنسبة للسكان . . . لتكون الأساس الأكثر دقة  
لعمل تقديرات الطلبات المستقبلية للتعليم يفرض تخطيط الواقع اللائحة للرافسق التعليميه  
ولتخطيط المخصصات بالنسبة للخدسات المستقبلية الخاص بالتعليم .

- يتطلب تمدد أو إنشاء نطاق أوسع من المؤشرات الخاصه بنوعية التعليم .

التحضير الطمهي والتشغيل لمركز الكمبيوتر .

يجب أن يعكس موقع الكمبيوتر اعتبارات متة :-

(أ) يجب توفير مساحات كافية لأجهزة الكمبيوتر . . . والآلات الطبع . . . والأوراق وتأمينات  
الكمبيوتر . . . وكذلك للعاطين طسي الكمبيوتر-

(ب) يجب أن يكون موقع أجهزة الكمبيوتر بعنفا بجانب بعنفا . . . حيث يتطلب أن يتكن  
العاطين طسي أجهزة الكمبيوتر من مساعدة بعضهم بعنفا في حل سائل البرجه .

(ج) أن أجهزة الكمبيوتر حساسه بالنسبة للضباب والحراره . . . ومن الضروري ان  
توضع أجهزة الكمبيوتر في منطقة يقيه بالهواء . . . ولها وقايه من الضباب  
والأوساخ .

(د) كما أن أجهزة الكمبيوتر حساسه بالنسبة للمعالجه الخشنه والأستخدام الغير صحيح .  
وطيه فأنه من الضروري أن تحفظ أجهزة الكمبيوتر في منطقة تكون بأمنه وصونه  
من الأشخاص الغير مدربين طسي أستعمالها .

(هـ) يجب توفير مساحه كافيه للشكن من ترتيب وحسن الناتج ( الأوراق التي تكسب طيهنا  
نتائج التحليل . . ) وذلك بالأسلوب اللائم . . يفرض سرعة الحصول طيهنا عند  
بتطلبها ستول من السوزارة .

يتبع ٤ / ٠٠٠

( و ) قالها ما تتطلب عملية تشغيل جهاز الكمبيوتر التي تركيز . . . و طيه فأن الساحة المصممه . . يجب أن تصح بالسرعه وذلك من خلال الحد من الأشخاص المصوح لهم بالوصول الى منطقة مثل الكمبيوتر .

#### مواقع الموظفين :

( أ ) يجب أن تميم مواقع الأشخاص الذين يتم تدريبهم للعمل على نظام معلومات إدارة التعلسم . . كل بجانب الأخر ليتسنى لهم ساعدة بعضهم بعضا بالنسبه للمائل أو المشاكل الناتجه بمسدد تشغيل الأجهزه أو وضع الميخ بالنسبه للتحليل .

( ب ) طسى وزارة التربه و التعلسم التفكير في إقامة نظام معلومات إدارة - التعلسم في مركز تطوير التعلسم و البحوث . . حيث وأن كاتبد بنوان السوزارة مزدهمه . . . وقد يكون من الصعب إيجاد ( ساحة كانه لمركز الكمبيوتر فيها . . و يتوفر في المركز ساحة كانه يمكن تكيفها و ضمان بأقل تكلفه . . . مقارنة بالساحة في السوزارة و بالأضافه الى ذلك - موظفي الكمبيوتر التابعين للسوزارة و المركز سيكونون طسى قرايه متصله ما يمكنهم من ساعدة بعضهم البعض في حل المشاكل الفنيه - و من خلال هذه يمكن الساعده . . . و التأكد من أن الموظفين طسى أجهزه الكمبيوتر التابعين للسوزارة و المركز طسى اطلاع بالنسبه للكيفيه الستم يقوم بها كل فريق في أعطاه الرموز للمعطيات و تعريف التغييرات . . و يحد صيخ تعاليل المعطيات . . كما وأن التقارب سيعاده طسى تشجيع التمسار بين المجموعتين .

## تدريب الموظفين

تتطلب نجاح تشغيل نظام معلومات إدارة التعليم مهارات أربع . . .

على أقل تقدير :

- (أ) عمل التمرينات لاحتياجات المعطيات وأنشأة الأجهزة بفرض تحميل المعطيات المرفوعة .
- (ب) مهارات في أعطاء الرموز والتقسيم . . . بالنسبة للمعطيات .
- (ج) تشغيل أجهزة الكمبيوتر والوسائل الممنوية التجارية ( برامج الكمبيوتر ) .
- (د) ترجمة المعطيات .

يمكن القيام بنجاح بعملية التدريب في التشغيل الكمبيوتر الدقيقه و برامج كمبيوتر مختاره . . من خلال سلمه من دورات تدريبيه قصيره . . ويجب أن تقام تلك السدورات في اليمن كلما كان ذلك ممكنا . . بأستخدام الأجهزة المتوفره في وزارة الترب والتعليم . . وتتبع هذه الأستراتيجيه أكانة شاركة عدد أكبر من موظفي الوزارة في السدورات التدريبيه . . كما أنها تقلل من المشاكل التي يواجهها المدرسون أحيانا في عملية تحويل تدريبهم من نوع من الكمبيوتر الدقيق الى نوع الأخر .

بالأضافة الى تلقي التدريب في تشغيل أجهزة الكمبيوتر . . يجب أرمال موظفين من الأرة يتم أختيارهم لتلقي تدريب طويل الأجل في التخطيط . . . الاحماء . . . وتحليل السياسه وبمسند عودتهم يحولون الى وظائف بالوزارة تكنهم من الساعده في تحد يد وصافسة أحتياجات المعطيات التي تتعلق بمائل أوسع في عملية السياسه . . . وكذلك أختيار وأنشأة النوع اللازم من تحاليل المعطيات . . و ترجمة النتائج بشكل يتيح ربط المعطيات بره الأخرى لأسور السياسه التي هي تحت النقاش .

وفي حين يكون أستمرار برامج تدريب الموظفين ضروريا لأستمرار تنمية الموظف التدريبي لنظام معلومات إدارة التعليم . . . فإنه من الضروري أيضا أستبقاء الموظفين الحاصلين على التدريب والخبره . . . ويجدر الأشاره . . الى أن الموظفين الحاصلين على مهار

- فسي الكمبيوتر . . سيكون لديهم العديد من فرص العمل الأخرى . . وفي هذه  
العدد فإن عملية استبقائهم في الوزارة سيتطلب الى نظام حوافز فعال .

#### أختصار برامج الكمبيوتر :

ينبغي على نظام معلومات إدارة التعليم لأعتقاد على برامج تجاربه شوفه  
وفي هذه المرحلة التي تتدمي أنشاء نظام معطيات للوزارة . . يمكن الحصول  
على كافة أحتياجات الخاصه بتحاليل المعطيات للوزارة بواسطة استخدام  
البرامج التجاربه وأضافه الى ذلك . . يمكن للموظفين تعلم البرامج التجاربه  
بسهولة أكثر . . مقارنة ببرامج لفه الأليات . . . حيث وأنه ليس من الضروري أن -  
يمرف موظف نظام معلومات إدارة التعليم ليتمكن من أحتساب الأحصائيات  
التي تتطلبها الوزارة لغرض التخطيط .

ينبغي على نظام معلومات إدارة التعليم . . وبالذات خلال السنوات -  
القليله الأولى من التنفيذ . . . توظيف عدد قليل فقط من البرامج التجاربه . . و ينبغي  
على كافة الموظفين العاملين على أجهزه الكمبيوتر أن يعملوا الى حد التفوق  
فيها . . . والجدد بالذكر أن عملية استخدام برامج كثيره تباينه . . ستؤد  
الى مشاكل ثلاث :

- ( ١ ) لن يتمكن الموظفين من ساعده بعضهم في حل المشاكل اذا لم يكونوا على  
أطلاع من البرامج التي يستخدمها الآخرون .
- ( ٢ ) يمكن أنشاء وقبوله ركائز المعطيات لبرامج متفاوتة . . . وبالتالي تصعب -  
عملية توحيد ركائز المعطيات أو إجراء تحاليل طمعي .

( ٣ ) فسي حالة مغادرة موظفي نظام معلومات إدارة التعليم الممل في الوزارة  
فأنه سيمسب على الموظفين الآخريين جمع تحاليل المعطيات التي كانوا  
يعملون عليها .

ينبغي تشجيع الموظفين على إجراء التجارب بالنسبه لبرامج الكمبيوتر الأخر  
فسي أنه ينبغي حصر العمل الرسمي على البرامج التي يتم أختيارها لأستخدام -  
الوزارة .

وهناك اثنين من البرامج التجارية تبعد وأن لديها مزايا  
معينه بالنسبة لوزارة التربية والتعليم :-

### برنامج أنابل :

يتكون هذا البرنامج من عدة برامج فرعية :

- تعاليل صفحات بيده - تستخدم التحليل العنقودي والأطر بالنسبة للأرقام
- إدارة المعطيات - تستخدم لتنظيم وتحريك ملفات المعطيات .
- البيانات - تستخدم لإنشاء الرسوم البيانية والمخططات البيانية .
- مطية الكلمة - تستخدم لكتابة التقارير والنصوص باللغسة الأنجليزية .
- مراجعة هجا الحروف - تستخدم لمراجعة حروف النصوص الأنجليزية وتحديد  
الكلمات التي تحتوي على أخطاء هجائية .
- وقد تم تحليل المزايا المعنيه لبرنامج أنابل في التقرير الأطول .

### برنامج اس . بي - اس اس - بي سي + :-

- بم هذا البرنامج خصمه للتعاليل الأحماليه من المعطيات بأعداد  
الكمبيوتر الدقيق . . . . . وتقدم سلسه مريضه من التنبؤات الأحماليه الناس  
للقيام بتعاليل ركائز معطيات واسعة ومعقدة نسوطا . . . . . وهذا النظا  
سهل أستخدامه مع معطيات وزارة التربية والتعليم في الجمهوريه العربيه  
المنيه بفرض مطية أحتساب الأتجاهات في السطيات المعطيه من المدارس . . . . .
- النواحي والأوبه خلال سنوات عده .
  - وبالإضافه الى برامج أنابل وأس بي اس اس - بي سي + ينبغي على وزارة التربية  
والتعليم الأستعانة حول وجود برامج تجاريه لمثل الكلمه باللغسة العربيه .

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## صادر المعطيات الخاصة بنظام معلومات إدارة التلميم

تشكل ثلاثة ركائز معطيات . . المعطيات العمومية لنظام معلومات إدارة التلميم : السجح السنون التي تجربها الوزارة حول التسجيل في المدارس الدراسية التي أجراها مركز تطوير التلميم و البحوث حول مواعيد و مرافق المدارس . . . و التمديدات السكاني لعام ١٩٨٦م التوفر من الجهاز المركزي للتخطيط .

## تحميل المعطيات :

- كانت التوجيه المنخفض من المعطيات هي الشكل الرئيسي في جهود تحميل المعطيات التي قامت بها وزارة التربية و التلميم سؤجرا و ينبغي على الوزارة التشد يد حول تحسين نوعية المعطيات التي تسمى على تحميلها حاليا . . . بدلا من توسيع أنشطة تحميل المعطيات . و لسررف تحسين نوعية المعطيات . . . ينبغي على الوزارة .
- ( ١ ) توفير التدريب للوظائف على مستوى اللواء و الدرسة بالنسبة للأجرات المحيطة في تعبئة القوائم .
- ( ٢ ) وضع إجراءات للتحقق من المعطيات و التي يقتضاها يتم التدقيق في القوائم و ملاحظة وجود أخطاء واضحه قبل إرسالها إلى صنعاء .
- ( ٣ ) توظيف إجراءات التدقيق في تلقي المعطيات . . . و التي يقتضاها . . . تدقق أزد واجبا . . . تلقي المعطيات الوافرة من أعداد السجح المشوايته .
- ( ٤ ) استخدام و إجراء تنقية المعطيات النهائية لتحدد يد . و تعدد بل المعطيات المنفقودة أو الأرقام التي يصعب الحصول عليها .
- بالأغاقه السى ذلك . . . قد ترفب الوزارة في استكشاف استخدام رسوز حاشيات

- لسح التسجيل السنوي حتى يتمكن من تخسير العمليات أيضا ما شئوره من القسه . . . كما وأن رسوم العاشيات تتخ بزياسا تحسين نوميمة المعطيات من خلال تقميل عدد المرات التي يتم تحويليل المعطيات خلال مرحلة التقيم . . . وقد نوقشت هذه الأجراس في الورقة الكاطه .

ينبغي على وزارة التربيته والتعلسم . . . ومركز تطوير التعلسم والبحوث والجهاز المركزي للتخطيط والتوظيف خطة رسوم مشتركه بحسب موقع القرى . وتوفر هذه الخطه . . . طريقه لتوجيه المعطيات الخاصه بالواقع الجغرافيه المشابهه عبر ركائز المعطيات . التبانته ) والجدير بالذكر أن خطة الرجز بحسب موقع القرى قد تم أنشائها وهي متوفره لدى الجهاز المركزي للتخطيط .

مطبات التحليل والترجمه وتقديم التقارير الخاصه بالمعطيات :

يتم تحد يد نسوع التحليل بحسب كميته أستخدام المعطيات . . . وسيكون أسسه و  
نظام معلوميات إدارة التعلسم المقترح .  
ثلاثة أستخدامات أساسيه هي السوزارة .

١- وصف نظام التعلسم .

يتم تحميل التحليل الوصفي من المعطيات الناجمه عن السح السنوي للتسجيل الذي أجرته وزارة التربيته والتعلسم .

٢- لتحديد ومراقبه الأتجاهات بالنسبه للتسجيل ، والتوظيف ، وأستخدام المرافق والتكاليف .

في حين يتم تحميل المعلومات المقارنه منها حول نظام التعلسم . . . فإنه بالامكان -

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تشخيص أخطاء مقدار التفسيرات نسي نظام التعلّم .

٣- لأنشاء تقديرات تكاليف التعلّم والتحويل والمعرض والطلب للمدات التعلّم :

يمكن دمج المعطيات بالنسبة للاتجاهات الحالية . . . بفرض أخطاء تقديرات احتمالات الأحداث المستقبلية نسي نطاق قطاع التعلّم .

خلال المراحل الأولى من أخطاء نظام معلومات إدارة التعلّم . . . ينبغي أخطاء الأولوية للتالي :-

١- تحاليل المعطيات التي قد سبق وأن تم تحميلها من قبل وزارة التربية والتعلّم . . . و مركز تطوير التعلّم والبحوث والجهاز المركزي للتخطيط بدلا من تحميل أنواع أخطائه من المعطيات .

٢- التحاليل الوصفية الأخرى الخاصة بقاعدة المعطيات التي يتم توفيرها . . . قبل السح السنوي للتسجيل .

ينبغي أن لا ينتقل نظام معلومات إدارة التعلّم الى التحاليل الأكثر تعقيداً بمجرد أن تضمن نوعية المعطيات . . . وبمقد أن يتحمل -  
- المعلمين على أجهزة الكمبيوتر على الخبرة المطلوبة في استخدام أجهزة الكمبيوتر . . . وبمقد أن يتوفر الموظفين الذين في الأقسام -  
- والتخطيط .

٣- لتشخيص الاتجاهات بمرور الزمن من خلال دمج المعطيات على مستوى النواحي والمافظات وموسم البلاد و بمرور الزمن .

ترجمة المعطيات :

ينبغي أن تؤكد ترجمة المعطيات على البداهات والسياسات المعقولة

- ووفقاً لذلك فإن دورها هي وصل نتائج تحاليل المعطيات مرة أخرى  
الى مناقشات السابعة في الوزارة .

نتائج تقديم التقرير :

ينبغي الأستمرار في تقديم تقارير المعطيات بشكل يكون موثقي  
وزارة التربية والتعليم على الأطلاق بذلك . . . كما وأن تقسيم النتائج بشكل  
جيد اول معروفه بشكل منتشر . لذلك فأنها مفيدة جدا . . . وبنفس  
توثيق الجداول والرسومات الهاميه أن تكون لديها هدر المعطيات  
. . . نوع التحليل . . . وصف المعطيات و أفتراغات التحليل بشكل جيد .

التوصيات

ينبغي على نظام معلومات إدارة التعليم أن تكون لديها مكتبة  
بكافة الكتب العامه بالسرورز و تحاليل الكمبيوتر النهائي نكل ركائز المعاد  
توزيع المعلومات من نظام معلومات إدارة التعليم .

ينبغي على وزارة التربية والتعليم إنشاء سباهه بمسدد توزيع نتائج  
التحاليل اليرتنيه . . . ونقترح أن تكون كافة التحاليل اليرتنيه ( شال تسجيلات  
المدارس والتوظيف وأستخدام الحافس ) أن تكون موزمه بشكل واسع في نطاق  
وزارة التربية والتعليم ليمتني لكافة المسئولين المسئول وفقاً للأحداث التعليميه بقتناه

مائل تنظيميه

أن عملية إنشاء نظام معلومات إدارة التعليم يمكنه من تقديم معطيات

- مؤوقه بشكل أكبر و دققه و في الوقت المطلوب بفرض استخدامها في تطوير  
سبابة التلميم . . . و طس كل حال يمكن أيضا للمعاملات أن تحد من الأختيارات  
. . . و يمكن لها أن تقيد القرارات التي أخذت وفقا لأختيارات سبابة  
أو أجتامعه من خلال أجار الأشخاص على الدفاع عن قراراتهم و طس أسس  
أكثر موضوعية . . . وفقا طبه فأن بعض السلولين هنا لن يدموا نظام  
معلومات إدارة التلميم اذا أعتقدوا أن السمطيات الناتجة ستؤدي إلى  
تفهير دورهم في السوزارة أو الحد من القرارات التي يرغبون في  
أخذها . . . . و ينبغي طس سولي السوزارة أن يتتموا بشعور جيد  
تجاه هذا الخط من المائل وبالذات خلال المراحل الأولى من أنشاء  
نظام معلومات إدارة التلميم . . . . }