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The Lagos Conference On  
Testing In The Developing Countries

7 - 13 April 1967

Lagos Nigeria

Submitted to the U.S. Agency For International Development  
As A Supplement To Fourth Semi-Annual Progress Report (Contract csd-798)

## FOREWORD

AID-AIR testing projects are currently underway in four different countries. Each of these projects is in some ways unique; but in all countries a team of American and local specialists is trying to solve the same set of problems with the same basic approach to attain the same developmental objectives. It was logical to bring the senior members of these teams together for joint planning and problem-solving discussions.

It was also logical to select Lagos as the conference site. The AID-AIR project in West Africa began six years before the projects in the three other countries, and has actually accomplished the things that elsewhere are still long-range objectives. The opportunity to inspect a large ongoing operation first-hand was certain to be instructive.

What was not logical was to ask the West African contingent, who were already scheduled to provide the major professional contributions, to take responsibility also for the many arrangements and preparations. Yet this is just what they did, and it seems appropriate to record the unflinching excellence of the conference arrangements as the first item of this report.

The West African Examinations Council, which is the home of the AID-AIR project in West Africa, hosted the conference and provided its major administrative support. Mr. J. A. Cronje, Registrar of the Council, made a special trip to Lagos to open the conference and to take part in the discussions. He gave freely of his own time and made possible also the extensive participation of his senior professional staff.

The USAID Mission to Nigeria solved the insoluble problem of transporting the participants among three conference sites, and provided numerous other items of logistic support. The Mission Director, Mr. M. F. B. Adler, and the Chief Education Officer, Mr. Samuel E. Fuhr, participated in the conference, and were gracious hosts after-hours as well.

The AIR Chief of Party, Dr. Victor J. Cieutat, and members of his team made the specific arrangements, managed the conference, and attended to all details. Dr. Linda Cieutat volunteered her services in organizing accommodations and meeting space, and conducted a complete survey of Lagos facilities as the basis for what proved to be a particularly happy selection.

Essential to the success of the conference was the kind offer of Dr. Frances Gulick to serve as volunteer rapporteur. As a highly qualified

professional in her own right, and as an experienced planner of development projects in many countries, Dr. Gulick was able to distill from each session the elements most critical to the conference objectives, and to prepare summaries of the type that a fellow researcher would find the most helpful. This report owes much to the accounts and analyses that Dr. Gulick prepared.

On behalf of all of the participants, we express to our West African hosts our most sincere appreciation.

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## I: CONFERENCE PROCEDURES

### A: Objectives

The Lagos Conference had three basic objectives. The first was to focus the experience of the entire group on the specific problems each country team had encountered, as a means of generating new insights and potential solutions. Both technical problems related to the design of suitable tests and institutional problems related to the development of indigenous testing centers were to be explored in detail.

The second was to find ways of coordinating the research so that the results of the individual country studies could eventually be combined into generalizeable findings applicable to a broad range of other cultures. To insure the compatibility of the data obtained at the various sites, specific attention was to be given to the formulation of parallel research designs.

The third was to establish direct channels of communication among local specialists in the four countries. Because the link that AIR has been providing is of necessity a temporary one, it seemed important to create an opportunity for our senior counterparts to develop a more permanent basis for continuing cooperation.

Thus, the task was to contribute to the more effective accomplishment of each of the individual country studies; and, at the same time, to capitalize on the additional benefits to be realized from joint efforts based on a world-wide perspective.

### B: Participants

The West African Examinations Council was represented by

Mr. J. A. Cronje	Registrar
Mr. E. B. Laryea	Principal Research Officer
Mr. M. A. Soriyan	Principal Research Officer
Mr. A. U. Usoro	Principal Research Officer
Mr. S. A. Akeju	Research Officer
Mr. J. K. Majasan	Research Officer
Dr. V. J. Cieutat	AIR Chief of Party
Dr. S. I. Frenkel	AIR Technical Assistance Advisor
Dr. R. T. Johnson	AIR Technical Assistance Advisor

The Center for Test Construction and Research of the Getúlio Vargas Foundation of Brazil was represented by

Prof. F. Tchaicovsky	Senior Counterpart
Dr. D. Angell	AIR Chief of Party

The Aptitude Testing Project of the Ministry of Education of Thailand was represented by

Dr. Poj Sapianchaiy	Senior Counterpart
Dr. A. H. Hill	AIR Chief of Party

The Testing Research Project of the Ministry of Education of South Korea was represented by

Dr. Chung Bom Mo	Senior Counterpart
Dr. Dan H. Jones	AIR Chief of Party

The U.S. Agency for International Development was represented by

Dr. Philip I. Sperling	Chief, Social Development Branch TCR
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The American Institutes for Research was represented by

Dr. Brent N. Baxter	Vice-President and Director of Research
Dr. Paul A. Schwarz	Director, International Division

Dr. Richard R. Rowe of Harvard University and the former AIR Chief of Party in West Africa participated as a consultant. Observers from USAID/Nigeria, the Ford Foundation, and other interested groups attended the open sessions.

#### C: Schedule

##### Friday 7 April

Opening Remarks

Overview of Brazil Project  
Overview of Korea Project  
Overview of Thailand Project

Discussion of Country Plans

##### Saturday 8 April

Aptitude Testing in West Africa  
Secondary School Testing in West Africa  
Achievement Testing in West Africa  
Research in Testing in West Africa

Monday 10 April

Problems of Vocational Testing

Problems of Scholastic Testing

Tuesday 11 April

Problems of Institution-Building

Strategies for Joint Research

Wednesday 12 April

Conclusions and Implications

Thursday 13 April

Closing Remarks

USAID/Nigeria Briefing

## II: SUMMARY OF PROCEEDINGS

### Session 1: The Individual Country Plans

Brazil. The Brazil Team reported that they had selected two of the country's urgent test needs as appropriate targets for the initial research. These were the development of scholastic aptitude tests for use in the primary grades, and the development of aptitude tests for selection into vocational training. Both projects were described in detail.

The problem in the primary grades is reflected in the educational statistics. Each year, 50 per cent of all children who have finished their first year of primary school are failed by their teachers, and must either drop out or repeat the grade. In the second and third grades, the corresponding failure rates are 25 to 30 per cent; and in the fourth grade, even after the rigorous early selection, about 15 per cent of the students are failed. As a result, only one out of every seven students who enter the first grade completes as much as four years of primary education.

The result of this high attrition rate is to throw into the labor market great numbers of people who can barely read or write or do simple numerical computations. In wasted, unused, and misused manpower potential, the cost to the economy staggers the imagination.

The problem, of course, is one of great complexity, involving many social and economic factors. There is no simple solution. More schools must be built, more teachers must be trained, more teachers must be induced to stay in the profession, and more children must be enabled financially to remain in school. The curriculum must be made more realistic, the instructional methods must be upgraded, and more reasonable standards of achievement must be applied.

The potential contribution of an effective testing program might appear to be but a small factor in this complex situation. But the effects of accurate tests would be significant, and the payoff relative to cost is probably higher for testing than for the other inputs required. A testing program is cheaper than building schools, faster than training more teachers, more straightforward than radical curriculum change, and more simply implemented than instructional-methods modifications. Most importantly, it represents a change that is possible; and most of the other changes, given the socio-economic constraints, are not.

At present, there are no common or standard evaluation procedures in use in the primary schools. For the most part, evaluation is left to the

individual school and to the teachers. Nor is extensive use made of scholastic aptitude tests. The assessment of what an individual has learned and what else he is capable of learning has depended on his teacher's judgment, and objective indices to improve these judgments must be introduced.

As a first step, the team plans to modify a number of the ID tests that were initially developed in Africa, and to subject these and a number of other instruments to systematic experimental evaluation. The school system of Guanabara State has pledged its full support to this program, and the first tryouts are scheduled to begin within the next two months.

Some of the problems that will arise in the implementation of this program include

- 1) Gaining the support of the private schools which are not under the control of the State secretariat, but which encompass about half of the primary school students;

- 2) Extending the ID tests for use with examinees who have had less than the six years of formal education that the West African studies have shown these tests require;

- 3) Obtaining reliable criteria of academic performance to use in validating the tests -- as noted above, evaluation of student performance is another key problem to be resolved;

- 4) Reconciling the long printing lag in Brazil with the rapid preparation and revision of test papers the tryout schedule requires; and

- 5) Developing effective procedures for scoring and analyzing the data by hand until suitable machinery becomes available sometime next year.

Comments and suggestions on all of these problems were specifically requested.

The problem in vocational training is that Brazil's demand for skilled manpower is growing much more rapidly than the capacity of the available training institutions, and that the training opportunities that are available are not being optimally employed. In the secondary school system, for example, there are five curricula the student may choose, including industrial, commercial, and agricultural courses. But as many as 85 per cent of the entering students in fact elect the straight academic curriculum, irrespective of their individual talents and inclinations.

In an effort to close the skilled manpower gap, three national apprenticeship programs have been undertaken. These are sponsored, respectively, by industry, commerce, and the Federal Ministry of Education.

Several hundreds of thousands of young people in the age range of 14 to 20 years receive training under these special programs each year.

The need for vocational aptitude tests is widely recognized both within and outside the educational system. In the secondary schools, there is a need for tests to help students select the fields in which they can be most successful. In the apprenticeship programs, the need is for the improvement of the admission tests now being used. And in the industrial sector, there are comparable test needs as well.

The team plans to evaluate a comprehensive set of aptitude tests, including modified versions of the ID Technical Series and a number of techniques that had been developed earlier in Brazil. The initial tryouts will be conducted in the industrial apprenticeship program, which has promised full cooperation.

The problems anticipated in this area are comparable to those described in connection with the primary school program. The construction of suitable tests is expected to be somewhat easier, however, because the examinees will be several years older.

Thailand. In consultation with a number of senior Thai officials, the Thailand Team developed a list of 13 important testing needs, and the order of priority in which these should be undertaken. During the present project, work will be carried out on the three highest priority items, which are the selection of vocational school students, the classification of students in comprehensive secondary schools, and the selection of students for teacher training.

The need in vocational selection has grown out of the rapid expansion of the Thai vocational school system which has been financed by loans from the World Bank and the Bank of Thailand, and which is receiving technical assistance from AID. Entry to the three-year courses in skilled trades and in business education will be from the ranks of students who have completed ten years of general education, but the methods that will be used in selecting applicants have not yet been developed.

In support of this program, the present project will develop a series of specific aptitude tests valid for use in selection. Both technical and commercial aptitude tests will be required, to accommodate both the trade and the business streams.

The research necessary to produce these tests has already been begun. A total of 12 ID tests has been modified for use in Thailand and tried out on 170 students in mechanical and clerical courses. School grades were used as a preliminary criterion for validating these tests, and modest to high validity coefficients have been obtained. Needs for further revisions were clearly indicated, however, and these revisions are now being made.

At present, there are only two comprehensive secondary schools in Thailand, operated at first on an experimental basis to evaluate the merits of the comprehensive idea. But, because the results at these schools have been highly positive, the program is being expanded in the next few years; and a variety of supportive test instruments is required. There is a need for tests to be used in the initial selection, and for additional tests to place students into the academic, business, or vocational streams.

It is planned to develop tests that will measure verbal and numerical abilities, clerical speed and accuracy, mechanical comprehension, space perception, and manual dexterity. An attempt will be made to devise tests based on printed instructions and separate answer sheets, to ease the administrative burdens imposed by the present ID procedures. As a supplement to these aptitude tests, a variety of objective achievement tests also will be developed. The combination of aptitude and achievement measures should provide an accurate basis for selection and placement decisions.

The pattern of teacher training in Thailand proceeds through a number of choice-points at which accurate selection tests are required. Students with ten years of general education may apply for a two-year course leading to an educational certificate, but fewer than 30 per cent of the applicants can be admitted. Students with 12 years of general education may apply for university-level training, but here fewer than 10 per cent can be admitted. Of the students who have successfully completed the educational certificate work 25 per cent can be selected for courses leading to a higher certificate, and 10 per cent can take supplementary work toward a bachelor's degree. In view of these small selection ratios, accurate selection tests are essential.

Much work on the development of such tests has already been done by the Test Bureau of the College of Education. The next steps are to improve the present version of the scholastic aptitude test, which is based largely on the American model, and the various achievement tests that have been developed. It will also be necessary to devise alternate forms of these tests, and to convert them to a machine-scorable form.

Some of the problems already identified are that

- 1) American-style mechanical aptitude tests tend to discriminate against Thai children from rural backgrounds, but the ID test is too easy for students at the tenth-grade level, indicating that an intermediate form must be developed;

- 2) Tryouts of translated forms of the ID verbal tests have indicated that about half of the items continue to be effective, but that a large number of new items are necessary to select adequately the differences in the conceptual structure of Thai;

3) Although the initial experimentation can be carried out by the center's professional staff, increasing numbers of non-professional test administrators will be needed in future, making the introduction of adequate quality and security control measures essential; and

4) On the institutional side, a testing center located within the Ministry of Education may not be able to provide the broad range of services that are needed in all sectors, in which case alternative organizational structures will have to be considered.

Group comments on these specific points and on any other aspect of the program described were invited.

Korea. The Korea Team noted that testing procedures are important not only to the huge educational complex (which commands 15 per cent of the national budget) but also in the other governmental and private establishments, and presented a series of flow charts showing the large number of career decisions being made at all levels in all sectors. This made the selection of highest priority projects difficult, but the Korean authorities did identify three that seemed especially appropriate to the present research. These were the development of college entrance examinations, particularly in the area of science; the development of classification tests for entry into the Army's specialized schools; and the improvement of the Air Force Academy selection tests for pilots and other administrative personnel.

The problem associated with the present system of entrance examinations constitutes one of the most difficult educational problems in Korea. Students are required to take entrance examinations to enter middle schools, high schools, and all institutions of higher learning. Fifty-three per cent of the elementary school graduates enter the middle school, 69 per cent of the middle school graduates enter high school, and 32 per cent of the high school graduates enter college. These selection ratios, coupled with the generally high motivation to go on to the highest levels, have produced severe competition. And this competition is further increased by the drive to gain admittance to what are perceived to be the best schools at each level. As a result, most Korean students spend day and night cramming for the various entrance examinations.

The university entrance exams, which are based on achievement in the major high school subjects, merit special consideration. They are not only inaccurate instruments for purposes of selection, as shown by the limited validity studies that have been done; but also an undesirable influence on the conduct of secondary education, as a result of the heavy emphasis given to straight memory in the examinations. And they provide a very poor basis for the placement of the students who are admitted. A recent study of freshmen at Seoul National University has shown that fully 50 per cent of them feel that they are in the wrong curriculum taking the wrong courses.

A great variety of problems has to be solved to improve this general situation. It will be necessary

- 1) To revise the present achievement tests to reflect more adequately the objectives of education and to provide more accurate predictions of college success;
- 2) To introduce aptitude tests that will be not only effective but also acceptable to both the students and staff;
- 3) To experiment with psychometric devices outside the area of cognitive tests;
- 4) To introduce refined statistical methods for combining and interpreting the test scores;
- 5) To develop criteria for evaluating the instruments based on success following graduation;
- 6) To resolve the administrative problems related to departmental quotas and the flexibility of transfers among departments;
- 7) To mechanize scoring, recording, computing, and other routine operations;

and to implement all of the other features of scientific personnel selection.

The sub-task of this total program that will be undertaken in the present study is the development of a combined aptitude and achievement battery for the selection of applicants to the scientific and technological fields. Reliabilities and validities against college success would be determined concurrently; and follow-up studies would be initiated against post-graduation criteria of success.

The major problems that are foreseen include

- 1) Gaining the support of the many vested interest groups both inside and outside the university,
- 2) Providing the clerical and computational support that will be necessary to complete the data processing within the remaining time, and
- 3) Injecting the results, if successful, into the mainstream of actual university operations.

Comments on these points were invited.

Tests for Army specialists are needed because of the Army's vast occupational training scheme. The Army has ten "military services," which are divided into 52 "occupational groups," which are further divided into 222 "special skills." A soldier's "military service" is determined at the time of induction; his "occupational group" at the beginning of basic training; and his "special skill" after basic training has ended. When all of these decisions have been made, he is sent to one of 17 special training schools.

The Army is reasonably well satisfied with the first step of this process; i. e., with the assignment of inductees to the ten military services. But it is not at all satisfied with the procedures now being used in deciding on the soldier's occupational group and special skill. For this reason, it is planning to develop a comprehensive Army Specialist Classifications Test that would help to determine the specific skill in which each soldier could best be trained.

The total job is enormous. It requires sophisticated job analyses, extensive test construction, numerous validity studies, complete operating routines, and some realistic links with ongoing civilian programs. But the Army has its own working staff and budget, and so the task for our project would be one of technical assistance to the testing unit the Army has already established.

It is planned to provide the Army in the first instance with consultation on the conduct of the job analyses, and with opportunities for training members of their staff in psychometric techniques. A number of specific validity studies may also be conducted, inasmuch as the tests the Army needs overlap to a considerable extent with those that must also be developed for civilian applications.

The Air Force Academy enrolls about 280 cadets and graduates about 50 pilots each year. They plan to make more extensive use of aptitude tests in the selection of students, and would like to carry out cooperative studies with our project on the development of predictive tests.

At present, each applicant is screened first on a set of rigorous academic entrance examinations. These are achievement tests similar to those used in the major universities, and result in the elimination of about two-thirds of the applicant group. The one-third that passes this screen is then given a series of physical, mental, and character tests, including a new "Airman's Qualification Test" which was introduced on an experimental basis last year. On the basis of these tests, two-thirds of the remaining applicants are eliminated, and the remainder are admitted to the Academy as cadets.

The students then proceed through a four-year modified college training program which leads to the Bachelor of Science degree. The first

six semesters emphasize regular academic college courses, particularly in the areas of physical science and engineering, and include also airmanship training. The attrition rate during this stage of the program is between 20 and 25 per cent. The final two semesters are devoted to basic pilot training. At the end of the course, the most able cadets go on to advanced combat pilot training; others move on to training as cargo plane and helicopter pilots; and some 15 per cent are assigned as ground crew administrative officers.

It is planned to develop an experimental test battery, and to administer it to (1) a sample of pilots and administrative officers already graduated as a means of obtaining concurrent validity data, and to (2) the entering freshman class as a basis for follow-up predictive validation. It is thought that the small size of this institution, its readily accessible sample, and the excellent criteria of success that are available make this an unusually attractive opportunity for testing research.

Discussion. The technical issues that had been raised by the country teams were discussed briefly during the course of the presentations, but it was decided to defer detailed discussions to the sessions on vocational testing and scholastic testing to follow. The most important point made at this time was that the teams must not plan to evaluate their work strictly on the basis of predictive validity coefficients, but must also consider the impact of their innovations on the educational system as a whole. When new achievement and aptitude tests are introduced, the teachers of classes below this level will automatically gear their curricula and training to help their students pass these new examinations, and unless proper safeguards are introduced misunderstandings (e.g., as to the purpose of multiple-choice tests) can distort ongoing education.

The discussions of these various operational programs also led quite naturally into considerations of the institution-building component. A number of interesting questions was raised:

- 1) Should a permanent testing service be set up within the Ministry of Education or outside? If outside, where? How much autonomy is desirable and realistic?
- 2) How can you develop this institution to a position of pre-eminence when there already are a number of smaller testing units in existence, and when there may be publishing firms whose market is threatened by this new venture?
- 3) What steps should be taken to insure that the local research already completed is fully utilized by the new testing center, and that the professionals who have been doing this research continue to play an important role?

4) As the number of testing specialists being turned out by the universities in each country increases, what steps can be taken to insure their active cooperation and further growth? Should the creation of an active professional society be one of the responsibilities of the new testing center?

5) How can we build a sense of growth into the research being carried out by these junior people, so that they will not be driven out of the field by the rather dull routines of straight test construction? Can and should ways be found to stimulate more basic research? Might counterpart funds be used effectively to finance such basic research?

6) What kinds of tangible results can the center produce that will insure continued professional and financial support by local and external organizations? To what extent should the selection of projects be influenced by their potential impact on the agencies that the center is counting on for its continued support?

It was planned to discuss each of these questions in greater detail during the institutional development session.

#### Session 2: Experience of the West African Examinations Council

A detailed summary of the history, organization, functions, operations, and future plans of the Test Development and Research Office of WAEC was distributed to all participants, as was a brief outline of the organization and operations of the Council itself. The speakers at this session tried to amplify this report by explaining specific operating procedures that might be useful in other countries.

In the area of aptitude testing, Mr. A. U. Usoro noted that the standard selection practices in the days before the AID-AIR project had concentrated on English and arithmetic tests, supplemented by a personal interview on general personality factors. This method was used for all types of jobs, and gave candidates with a good knowledge of English a special advantage, irrespective of their specific aptitude for the job in question. He described the greatly improved accuracy of selection that was achieved after the ID tests were available, and cited supportive data on the accuracy of these tests and the others that TEDRO subsequently developed. He also enumerated the large number of institutions in West Africa that is now using these tests in their selection programs.

Mr. Usoro identified three types of problems that had proved particularly troublesome in this area, and suggested approaches to their solution.

The first problem in setting up a testing program for a new client organization is to obtain accurate information on the skills that the job actually requires. Mr. Usoro recalled, as a specific example, the job

description that had been provided to TEDRO when they began their work on selection tests for the police. This description went roughly as follows:

The Nigerian Policemen must have: the eye of a hawk; the speed of jet planes; the worldly wisdom of an undergraduate; the strength of Samson; the patience of a husband; the memory of an aggrieved woman.

He suggested that every testing center should have access to dictionaries of occupational titles, since these provide a good first approximation of the skills to be tested. But he cautioned also that the center's research plan should include preliminary job analysis, so that the center's staff can collect their own hard data on what the job really requires.

A second key problem has been the lack of reliable criterion data of performance on the job of the people earlier tested. TEDRO has relied mainly on the ratings of supervisors, but the data suggests that these ratings are not highly effective. A separate research study to develop more accurate criterion instruments is now being undertaken in TEDRO, and Mr. Uoro recommended that special research on criteria be carried out also at all other sites.

A third problem has been the training of the individuals who administer the tests. In service programs for industry, it is not practical to send a professional member of the staff to supervise each testing session, nor is it always feasible to ask the employers to send their applicants to the center for testing. The client organizations' own personnel have to be trained in the use of the center's tests. Mr. Uoro reported that the TEDRO approach to this problem -- which is to conduct intensive two-week workshops in testing twice a year -- has been highly effective. These workshops have been attended not only by West Africans but by representatives of interested groups from as far away as Morocco, Uganda, and Kenya.

In response to a specific question on the use of non-cognitive tests, Mr. Uoro indicated that the requests for services that can be met entirely by cognitive tests have been so overwhelming that his staff has not had time for an intensive effort on interest and personality tests. Fragmentary data to date indicates that biographical information so far has proved ineffective, but that interest tests based on incidental information have provided useful results. Some experimental tests of the non-cognitive type are now being evaluated in a study of selection tests for nursing trainees.

In the area of secondary school selection, Mr. M. A. Soriyan reported that a battery of five tests is currently being used. These tests include Arithmetic Achievement, English Achievement, Quantitative Aptitude, Verbal Aptitude, and English Composition. The last of these is an essay test; the other four are objective. Each objective paper includes 60 items, ten for initial practice, and 50 for purposes of the test.

The achievement tests are written by secondary school teachers, who have been given special training in item construction. The aptitude tests are written by the TEDRO staff. For a 50-item test a total of 100 items is constructed, and these 100 items are subjected to experimental tryouts before the final version is written.

Fixed criteria have been established for selecting from the tryout items those that are suitable for inclusion in the operational form. The most important criteria are that the level of difficulty must be above 10 per cent, the correlation of the item with the total test score must be .20 or above, and all wrong choices must be negatively correlated with total score.

Separate and machine-scorable answer sheets are used. Mr. Soriyan reported that until recently the main problem with separate answer sheets has been the coding of candidate names and identification numbers into a form that the machine can read. Having the candidates do this leads to an unacceptable number of errors; having it done by the TEDRO clerical staff is a time-consuming and costly chore. But now procedures have been developed for using the computer to pre-print this information on the answer papers. When the papers arrive at the testing centers throughout the country, the monitors need only give each candidate the paper on which his name has already been printed. Wherever computers are available, Mr. Soriyan highly recommends this procedure.

After data processing, the center reports to each school the scores of their candidates, expressed in standardized form. They also provide a total score, obtained by giving each of the four sub-tests equal weight. The use that is made (or not made) of the essay paper depends on the individual school. Some schools use the essay only as a basis for comparing the handwriting on the essay with the handwriting on the application form to make sure that no ringers were used. Other schools score the essay papers themselves for students who are on the borderline between acceptance and rejection, and use the essay in this manner to break ties.

Mr. Soriyan stressed the importance of giving the candidate full and complete information about the nature of the tests in advance of the examination. He distributed copies of the special registration form that TEDRO sends out to the schools when the test is announced. Half of this form is the regular application blank, but the other (detachable) half consists of a set of practice problems for the student to work on in advance of the test for purposes of familiarization. The group considered this a particularly useful device, and indicated that they could make good use of it in the other countries.

In the area of objective achievement testing, Dr. V. J. Cieutat noted that the basic work on these types of tests was carried out before TEDRO came into being, under a separate grant from the Ford Foundation. Under this grant, objective forms were developed for a number of the tests included in the West African School Certificate examination, which is

required for graduation from the secondary schools. Prior to 1966, all of the tests in this examination had been of the essay type; but last year, for the first time, six objective tests were included. These were in English, mathematics, and several science subjects.

Most of the research on these tests, Dr. Cieutat pointed out, has been oriented toward demonstrating that they are at least as effective as the traditional essay examinations. This came about because objective tests had not been accepted on their own merit, but had been approved reluctantly on the basis of strictly economic considerations. The costs of using essay tests for the rapidly growing number of candidates had become prohibitive, and changing to machine-scorable procedures could not be avoided.

Dr. Cieutat distributed the statistical analysis of the first evaluative study that had been carried out on these new objective tests. In 41 secondary schools in Ghana, comprehensive performance evaluations were obtained from the school principals (to reflect each student's work over the past five years), and these were correlated school-by-school with the objective test scores. The resulting correlations were high. This indicated that the objective test provided as good an evaluation as could be obtained from the schools themselves; but, in addition, made possible the comparisons among schools that could not be made on the basis of the separate performance evaluations.

Mr. B. Laryea, who is responsible for the preparation of these tests, described their development step by step. The training of item writers, the conduct of experimental tryouts of all items, and the careful editing by central staff were found to be especially important to the production of sound tests.

The ongoing testing research was summarized by Dr. R. T. Johnson, who elaborated on the 32 separate projects listed in the TEDRO report. He noted that most of these studies are devoted either to (1) an analysis of the efficiency of current procedures, or to (2) the development and evaluation of alternative techniques; and that, because of the extensive computations involved in these types of studies, the availability of a computer has been essential.

The main use that has been made of the computer, however, has been as a substitute for manual clerical operations. It is actively used in operational (as contrasted to research) programs as a means of quickly preparing rosters, means, standard deviations, frequency distributions, etc. The participants were particularly interested in the data processing configuration of TEDRO, and Dr. Johnson described this in detail. The present equipment includes an IBM 1230 optical reader, which scores the test papers and converts the scores into the form of punch cards, and an IBM 360 Model 20 computer. The system is being changed to eliminate the need for converting test papers to punch cards in the middle of the operation. In future, the

scoring machine will be linked directly to the computer and the test papers will be converted to printed rosters of results with no intervening handling or manipulations.

Dr. Johnson also described the computational programs that have been developed by TEDRO, and provided each of the participants with a complete list. He indicated that copies of all of these programs had been filed with the European Program Library, and are available to the various country teams from that source. The programs have been designed to be compatible with several different types of computers.

Other Issues. A number of issues that cut across all of these separate areas were raised in the discussion. The most important of these were security, sales, and the fee structure.

On security, TEDRO has introduced tight control of all test materials that cover the entire process of printing, storage, shipment, and use. The examiner and the proctors assigned to each testing center are people who are not known to each other, and central supervisors make unscheduled visits to these sites for surprise inspections. The use of machine-scoring has eliminated one source of tampering with the results; and the internal consistency checks that are included in the data analysis also point up deviations suspicious enough to be investigated further. But the most important single security control is to have available a large number of parallel test forms, and to keep introducing new test forms, so that it is virtually impossible for students to memorize answers in advance. For this reason, TEDRO has tried to devote fully 50 per cent of its effort to the development of new test forms, and a comparable degree of emphasis on this aspect was recommended to the other sites.

The most effective way of selling a potential client on the introduction of the unit's testing services is to carry out a demonstration study on his present employees. The typical result is that the evaluations of the tests correspond closely to the evaluations of the employer, and this is far more persuasive (even when the numbers are small) than showing him large-sample validity coefficients based on studies done somewhere else. On occasion, TEDRO has offered cut-rates to a new prospect or even done the initial testing free, so as to demonstrate first-hand the type and speed of service that he would be provided.

The question of testing fees for commercial organizations had been quite heatedly debated when TEDRO began. The tradition in West Africa had been that applicants would pay the companies or the interviewers for the privilege of being considered. Would these firms and individuals now be prepared to pay someone else for administering the test? Experience has shown since that time that charging fees is highly effective. Commercial organizations are quite prepared to pay the fees that are charged (which range from \$3 to \$10 per head), and tend actually to use test results for

which they have paid. The fees charged to schools are borne by candidates themselves. For some programs, the school is charged only a nominal fee to reflect the cash subsidy that government grants through the Ministries of Education to the Council each year.

### Session 3: Problems in Vocational Testing

On the basis of the individual country presentations and against the background of the TEDRO experience, the participants discussed the major problems to be resolved before productive work could begin at the new sites. Six areas were discussed in detail.

Suitable Demonstration Projects. The group noted that there was a basic difference between the TEDRO operation and the centers being established in the other three countries. In the new centers, the work is still considered experimental and tentative, and there is not the same assurance that TEDRO now has of continued support after the present project expires next year. It is unrealistic, therefore, to take on projects in this area that may require several years before they can demonstrate effective results. It is necessary to demonstrate tangible pay-offs within the next year. Given this additional requirement, in which fields should work begin? More specifically, should the initial emphasis be within the educational system or in the private sector?

On the education versus industry question, there was support for both approaches. Those who favored starting within the education system pointed to the extremely large groups that are available for research purposes, to the favorable selection ratios, and, since the schools are the one part of the manpower pipeline common to all sectors, to the opportunity to contribute to all programs all at the same time. Those who favored the private sector pointed to the "cleaner" criteria of success in industry, where evaluations are less contaminated by non-aptitude factors; to the opportunities for expressing pay-offs in tangible cost terms; and to the greater ease with which new procedures can be introduced. On balance, however, the majority recommended a beginning in the vocational streams of the formal school system.

As a general rule in selecting initial projects, it was suggested that special attention be given to the recognized "hurts" in the society; i.e., to make sure that the problem being solved is a problem that is recognized as important. In this connection, a member of the TEDRO staff cautioned the group to consider not only the hurts perceived "by your clients but also those important to your prospective bankers." Using a high-level advisory committee as a vehicle for deciding which needs are in fact the most important was specifically recommended.

From a technical point of view, it was noted that the decisions would not greatly affect the substantive work that is done. Most of the tests needed by the vocational schools could be applied equally well in industry and vice versa.

Deferential Prediction. In selecting problems, the group was specifically cautioned against attempting to make finer discriminations than the state of the art in testing permits. Differentiating individuals with technical aptitude from those with higher aptitude in the commercial fields (as will be done in Brazil) is realistic. Trying to sort people into specific trades, such as mechanics rather than machinists, is not. For purposes of high-impact research, guidance applications particularly should be avoided. It is extremely difficult to set up an effective guidance program, and it is almost impossible to demonstrate its success. Only after the effectiveness of the operation has been clearly demonstrated through selection studies should applications to guidance be considered.

Types of Tests. In the first instance, also, the effort should concentrate on selection for training rather than selection for actual jobs. For the latter, proficiency tests would be needed in addition to the basic aptitude tests, and this would be too much work to take on.

The types of aptitude tests that might be useful were discussed in detail. It was noted that tests would have to be developed at several quite different levels since the decision-points for entry into vocational training vary from the fifth on up to the tenth grade. It was agreed that the ID tests would have to be modified for use in the other countries, and a variety of specific modifications and simplifications was discussed.

Dr. Cieutat reported that a comprehensive factor analysis of the ID tests was recently completed. He promised to send the results to the participants as soon as they were available for distribution.

Criteria. Considerable attention was given to the choice of criterion instruments appropriate for the validation of vocational aptitude tests. The key problem is that most performance evaluations reflect a variety of skill and non-skill factors, and that it is difficult to separate out the skill factors with which tests of aptitude should properly be compared.

One approach, carried out in a technical high school in Nigeria, was to obtain separate evaluations for that part of the course that consisted of theoretical or general subjects and that part that dealt specifically with practical applications. It was found that the ID aptitude tests were highly correlated with the practical work, but not with the theoretical courses; and that a composite evaluation, such as over-all grades, would have given greatly distorted results.

Obtaining special evaluations distinct from the recorded grades was specifically recommended. Good use has been made of the alternate ranking procedure in which instructors or supervisors pick out the best and the worst trainees of a group, then the next-best and next-worst, and so on until an order of merit has been established. Ranking procedures based on paired comparisons of the trainees are another useful approach.

Reporting. In operational testing programs, the form in which the results are reported to the clients is extremely important. The scores should be simple, their meaning should have been explained to the users well in advance, and the report form itself should repeat the explanation. TEDRO gives clients a separate card for each examinee in which his rank in the over-all distribution is graphically represented.

Proprietary Rights. The ownership of tests produced under technical assistance programs was also discussed, with special reference to copyright regulations. It seemed reasonable to the group that any instruments prepared in a host country institution should be the property of that institution, whether or not outside specialists did much or most of the work. But this is not entirely consistent with the provisions of the AIR contracts, in which all materials developed under the contract become the sole property of AID. This issue was not resolved, but it was pointed out that there has never been a problem in practice -- a decision on who owns what has not so far been required for any practical application. Some of the countries may well wish to copyright locally produced instruments, however, and it would be desirable to settle the issue at an early opportunity in consultation with AID.

#### Session 4: Problems in Scholastic Testing

Because the major program in the scholastic area to be undertaken in the near future is the Korea project for the selection of science majors, most of the discussion centered on admission tests at the university level. Many aspects of the six topics discussed, however, apply equally to the lower levels.

Over-all Strategy. The key problem in doing research of this type at this high level is thought to be that of gaining the acceptance of the institutions involved. It is important to design the research not only from the point of view of the excellence of the data that it will generate, but also in terms of the impact that it will have on the intended consumer.

One specific suggestion was to avoid research designs that may show up the present selection system as being as terrible as it probably is. A second was to build in an opportunity for all of the groups that have a vested interest in the present system to participate in the development of the revised procedures. A third was to involve the key faculty members actively in the process of validation, using their evaluations as the criterion that the tests would have to predict to be accepted.

Test Development. With respect to the types of predictors to be used, the group felt that as much attention should be given to indices other than tests as to tests of the type normally used. In view of the consistent predictive validity of high school rank, working out procedures for using such data would be particularly helpful. Other approaches should also be explored, and one good way of beginning such studies might be to interview students who had dropped out or who felt they had wound up in the wrong courses.

On the test side, high-level forms of the typical verbal reasoning, abstract reasoning, and mathematical reasoning tests should be developed. For the selection of science majors in particular, good use might be made of the special tests for this purpose that AIR had developed some years ago for the Bureau of Naval Personnel. This test was based on an extensive study of the critical requirements for scientific personnel, notably those to work in research.

Attention should also be given to the use of moderator variables to improve the accuracy of prediction. Test scores may have to be interpreted differently in accordance with the examinee's past education, sex, urban or rural background, and other such factors. The necessity for separate regression equations should be kept in mind.

The mechanics of producing adequate tests at this level were also discussed. For achievement tests, subject-matter experts should be given specific training in test construction. For all tests, complete item banks should be set up and maintained.

Criteria. In addition to the common criterion problems that had already been noted in the discussion of vocational aptitude tests, criteria at this level should have a broader base than just demonstrated academic success. Specifically, it was felt that the student's satisfaction with his choice of career should be included, and that some attempt should be made also to follow up on the performance of the examinees after graduation. The desirability of using peer ratings as a means of tapping some of the non-cognitive elements of the "well-rounded man" was also discussed.

Norms. The consensus on standardization was sharply different from classical testing tradition. The group felt that extensive standardization studies are normally done just for show, and are a needless luxury that developing countries cannot afford. It is only when tests will be given to small groups or when they are to serve for purposes of individual guidance that norms are useful. Large applicant groups generate their own norms; and, in practice, the standard admission policy is to accept the best of the group, irrespective of the underlying population characteristics.

Reporting. The discussion of the procedures to be used in reporting results reflected the concern that had earlier been expressed about gaining

the acceptance of senior professors. It was felt that the results should be expressed in percentages or in graphic form rather than in the form of correlations, lest the discussion get bogged down in statistical manipulations. Particularly useful, it was thought, would be charts showing the probability of successful completion of the course for people at each level of the entrance examination. The initial presentation of the results should in all cases be in a face-to-face discussion, not through a written report.

Fees. It seemed unreasonable to the group to expect that all costs of a scholastic testing program could be met by the fees that may be collected, but that fees should nevertheless be charged. Getting as close as possible to the break-even point makes it easier to make up the deficit through government subsidies or fees collected from other programs. In West Africa, the School Certificate Examination invariably loses money, but the profits realized on the commercial testing and on the secondary school entrance examination help to make up the deficit incurred.

#### Session 5: Institutional Development

In this session, the group considered the various requirements for establishing and developing a testing center. Seven broad areas were discussed.

Getting Started. This discussion elaborated on the comments made earlier about the importance of choosing the right project to do first. Again, it was stressed that the initial impressions a new activity makes are always the most critical; and that in a field such as testing, which affects the lives of so many people so very directly, a solid beginning is particularly essential.

The teams were advised to begin with a specific problem, selected in accordance with the criteria implicit in the following questions. Is this perceived as a crucial need in the host country? Are we confident that we can come up with an effective solution? Can we have at least partial results to show for our efforts within a short time after the work begins? All agreed that an excellent solution to one specific problem is far superior to modest improvements on five or six different fronts. The initial effort should be concentrated and not diluted.

Most weight should be given to the degree to which the problem is perceived as important. In this connection, the team should disregard their own values, and concentrate on the needs as expressed by local officials. Even if the local interest is limited to solving the logistic problems of essay tests, for example, this is nevertheless an excellent opportunity to make an important contribution.

Organization. The TEDRO representatives felt very strongly that the only suitable organizational pattern for a national testing service was the

autonomous or semi-autonomous unit not affiliated with any one governmental institution, and the other participants tended to agree. Still, it was felt that local conditions might dictate a different structure in any one country, and that the decision should be deferred until the local authorities had had an opportunity to evaluate the testing operation and make an appropriate determination.

This raised an immediate problem. Since the testing center must have an official "home" in order to begin operations, how can a home be selected that will not prejudice the center's subsequent shift to a different pattern of operation? The agency that had provided the home initially would almost certainly resist any change in the status quo, even though another pattern might on objective grounds seem to offer more scope.

One suggestion was to make sure that the Advisory Board includes broad representation outside the specific agency to which the center is initially assigned, and preferably also representatives outside any governmental organization. This would promote flexibility with respect to future reorganization, since a broad range of interests would from the first have been included at the policy-making level. In the composition of the Board, it is desirable also to strive for representatives of roughly equal status, lest one or two very senior officials inhibit the free flow of ideas.

A second suggestion was to be alert to opportunities for applying the instruments developed in response to one problem to similar needs in other sectors. The tests developed for selection into the vocational streams of the educational system, for example, would almost certainly have applicability to industrial needs, and such opportunities should be actively explored. Having ongoing programs in a number of sectors would also avoid too close identification with any one group.

Scope. The main areas for the application of testing services are the educational establishment, the civil service, the military, and the private sector. It was felt that the emphases given to services in these sectors could vary widely from site to site, so long as the educational establishment is included. A testing center that does not have a strong base in the educational system is likely to be a dead end.

Some thought was also given to the desirability of broadening the charters of the new centers to areas other than testing. It seemed to many of the group to be somewhat artificial to split the identification of human resources from the actual development of these resources, and that a broad mission of which testing is only one part might well lead to substantial economies for the host country. Certainly, a broad program of human resource development would make most efficient use of scarce personnel resources.

Training. The needs for professional staff and the appropriate training of these staff were considered at some length. Opinions differed on certain specifics, but all agreed that (1) training should consist of both on-the-job training and formal education, preferably in a "sandwich" arrangement; and that (2) the temptation to use professional staff for non-professional functions must be resisted. With respect to the latter, such tasks as test administration and scoring and billing and other routines should be delegated to an administrative/clerical infrastructure, and the decision of the West African Examinations Council to split R&D and operations into two entirely separate entities may afford a sound model to follow.

On the issue of Ph.D. training, there were differences among the countries. In some locations, having a doctorate title was important to professional acceptance; while in others, this was a minor consideration. But all agreed that the skills and maturity associated with the doctorate level are essential to a successful testing center, and that Ph.D. training for some of the staff should therefore be planned.

A strong case was also made for overseas refresher courses for senior staff some years beyond the Ph.D. Keeping up with the field is difficult in most of these countries, and the stimulation of a periodic change of scene would be beneficial. It was suggested that organizations such as AIR or ETS might organize high-level seminars for overseas specialists to meet this need.

Continuing affiliation with a local university might also be helpful to the professional development of the staff. In West Africa, a program of joint appointments by TEDRO and a university is being developed.

Facilities and Operating Procedures. Most of this discussion centered on special precautions related to the security of the tests. A wide variety of suggestions was offered.

The physical facility should include a secure storage room, constructed much as a vault. Also available should be such equipment as paper shredders, numbering machines, and multilith for in-house duplication.

The operational procedures should include provisions for keeping track of each test at each stage of its development and use. If outside printing facilities have to be used, a professional staff member should stand by during the operation, and take away the plates and all spoiled copies when printing has been completed. It is also prudent to avoid printing the name of the test or its intended application on the paper, so that people who might somehow obtain a copy could not be sure of what it is that they have.

When alternate forms are not available, it is often useful to print several versions of the same test with the items presented in a different order. This avoids copying when the test has to be administered under

crowded conditions, but does mean that special care has to be taken in the scoring operation to use the right key for each version.

A good general principle is to assume that once a test has been administered, no matter how tight the controls, it is no longer secure.

Support. The broader the base of support, financial and otherwise, the better. It is wise to identify potential sponsors even before extensive support is required, and to make an active effort to keep them informed and involved in the center. It is sometimes possible to obtain the strong backing of organizations that have no direct testing needs by providing them with other services that the center can provide. TEDRO, for example, has made its computer available to many organizations and has given them help in the design of the data processing routine. This has taken only a little staff effort, but has generated widespread good will.

Internally, the management of the center is greatly simplified when it has its own budget, and a cash account under the direct control of the center director. Government appropriations to the center should be specifically earmarked as a separate line item, and should not be lumped into a total allocation to the center's parent organization.

Criteria of Success. The group also considered the criteria that they might apply to evaluate the success of their operation. The only yardstick to which all could agree was the demonstrated capability of the local professional staff, and it was decided that this should be adopted as the chief effectiveness measure.

Similarly, an evaluation of the effectiveness of the external assistance component should be determined by charting each year the proportion of the total operation that is fully managed by indigenous staff. There was discussion but no agreement on the optimum length of time for a technical assistance project in testing, and it was thought that some evaluations of the effects of early and late withdrawal in past projects might be instructive.

#### Session 6: Research Strategy

The problem for this session was formulated as follows. Had we retained the emphasis of the original contract for this project -- to do research that will generate a handbook on overseas testing applicable to many different cultures -- we could have developed a standard research design to be implemented at all sites. This would have insured comparable data on the many questions to be answered. But, having changed our emphasis to the solution of local problems, which have turned out to be different at each site, a common research design cannot be used. How can we build enough comparability into the project as it is to be done now to produce the handbook that is still to be generated as a by-product of the research?

Disagreement was rampant. The spectrum of answers suggested ranged from asking AID to drop the handbook requirement completely to doing two sets of studies at each site, one to meet local needs and one to generate common data.

Eventually, the following course of action was adopted:

- 1) Research would be limited to needs of the local country. No special studies would be undertaken.
- 2) For each of these local needs, there will exist a "standard" approach, defined as the one we would normally use in the United States. This standard approach will be tried as the first trial solution.
- 3) The effectiveness of this standard approach will be evaluated by considering all of the needs that it should meet in the local situation. That is, such elements as cost or administrative feasibility will be considered as well as the statistical results of the test.
- 4) If the standard approach does not meet the local needs, the team will adapt the approach as required. The principle of parsimony will be followed in that the minimum number of changes necessary will be introduced.
- 5) When an effective approach has been developed, each team will try to explain precisely why it was superior to the standard approach. This explanation is to be based on the best information available, whether this consists of personal hypotheses, the informed opinion of other experts, empirical data, or a combination of these.
- 6) Having decided on a suitable explanation, the team will compare its conclusions with those outlined in the draft Handbook already prepared. If they are consistent, the local results will be kept on file for inclusion in the next Handbook revision.
- 7) Whenever the local findings and explanations differ from the present Handbook or are not included in the present Handbook at all, the team will immediately notify the AIR home office. The home office will take responsibility for sharing this information as quickly as possible with the teams at the other sites.

This would enable each team to work within the context of a common over-all research strategy, while addressing itself specifically to the local problems to be solved.

### III: CONCLUSIONS AND IMPLICATIONS

The final session was devoted to a summary of the major conclusions of the conference and to an evaluation of the conference itself. On those items that required immediate action, appropriate responsibilities were assigned.

Conclusions. The major conclusions concerning the implementation of the projects have already been described in the preceding sections of this report. The group reviewed these, paying particular attention to the guidelines for institutional development that had been suggested, and to the over-all research strategy that is to be followed at all sites.

In addition, the group felt that the extensive time that had been required to get the projects organized at each site constituted an important lesson in itself. They suggested that all of the reasons for delays and changes in orientation be systematically recorded, as a guide to the planning of future development projects of this type.

The teams agreed also that they would have to give high priority during the next few months to the provisions for the continuation of the project after the TCR phase ends. This would include extensive consultations with local officials, and an active exploration of the interests of the various sources of external assistance. If the continuity of the project could be assured, all teams felt that the long-range objectives in their respective countries would be fully achieved.

Conference Evaluation. All of the participants were highly enthusiastic about the progress that had been achieved. They felt that the opportunity to study the WAEC operation and to have more intensive discussions with TEDRO officers after hours was productive of many specific ideas immediately applicable in their own countries. They also noted that this was the first time they had been able to get a wide range of different points of view on the problems they had encountered and that this helped them to understand the many dimensions of their projects more fully. Each reported that the conference was professionally refreshing and an effective problem-solving approach.

Accordingly, the group decided

- 1) To promote similar conferences within their own countries, to extend these benefits to the rest of the professional community; and
- 2) To try to hold a second international conference of this type near the end of the year at one of the other project sites, to exchange the

additional insights that will have emerged and solve the new problems that will have arisen when each of the projects has developed to the next stage.

The desirability of inviting professionals from neighboring countries to the national conferences and of expanding the representation in the international conference was stressed.

Specific suggestions for the improvement of the next conference were

1) To allow more time to a study in depth of the local institution that hosts the conference;

2) To exchange lists of highly specific problems in advance of the conference, to allow ample time for preparation; and

3) To make arrangements for two rapporteurs, to ease the take-notes-all-day and type-stencils-all-night regimen to which the rapporteur at this conference was subjected.

Each of the visitors offered his center as the site of the next conference, in the hope of being able to repay the hospitality extended by the West African group.